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San Francisco, CA

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The purpose of the City of San Diego Metropolitan Facilities Plan is to determine and recommend the most cost-effective, socially and environmentally sound means of achieving, in the San Diego Metropolitan Area the national water quality objectives.

Implementation of the Plan requires consideration of environmental concerns in three different topic or issue areas. These environmental issues or concerns are;
1) Marine Discharge of Primary Treated Sewage Effluent
2) Secondary Impacts of Growth
3) Tijuana Wastewaters

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SAN DIEGO METROPOLITAN FACILITIES PLAN

DRAFT ENVIRONMENTAL IMPACT STATEMENT

OCTOBER, 1977

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REPRODUCED BY
NATIONAL TECHNICAL INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA 22161

DRAFT

SAN DIEGO METROPOLITAN FACILITIES PLAN

Wastewater Treatment, Reclamation and Disposal
1975-2000

October 1977

Prepared By:

U. S. Environmental Protection Agency
Region IX
100 California Street
San Francisco, CA 94111

Grant No. CA-06-1092

Responsible Official:

Paul De Falco Jr

Paul DeFalco, Jr.
Regional Administrator
U. S. Environmental Protection Agency
Region IX

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

OCT. 0 1 1977

To All Interested Agencies, Public Groups, and Concerned Individuals:

The Draft Environmental Impact Statement/Environmental Impact Report for the San Diego Metropolitan Facilities Plan is submitted for your review and comment. This statement has been prepared in compliance with the National Environmental Policy Act of 1969 (P.L. 91-190), and implementing regulations promulgated by the Council on Environmental Quality and the Environmental Protection Agency.

Comments should be sent to this Office within forty-five (45) days of the date of this letter. All comments received will be considered in the preparation of the final Environmental Impact Statement for this action. In order to receive public comment, the Environmental Protection Agency, Region IX will hold public hearings on the Draft EIS during November, 1977. The times and places for these hearings will be provided at a later date. All interested parties are invited to express their views at the hearings. Persons wishing to make comments may submit same in writing and/or appear at the hearings. Oral statements will be considered, but, for the accuracy of the record, all important testimony should be submitted in triplicate to:

Environmental Protection Agency
Attn: Hearings Office
Region IX
100 California Street
San Francisco CA 94111

Enough copies of the written material should be provided so that the other interested parties at the hearing may receive a copy. Oral statements should summarize extensive written material so there will be time for all interested parties to be heard. The Draft EIS and supplemental information, including the Facilities Plan may be reviewed at:

EPA, Region IX Library
100 California Street
San Francisco CA 94111

Freedom of Information Center
EPA, Room 329
401 M. Street
Washington D.C. 20460

These documents will also be available at all local public libraries within the service area of the San Diego Metropolitan Sewerage System.

Please bring this notice to the attention of all persons who would be interested in this matter.

Sincerely,

Paul De Falco Jr

Paul De Falco, Jr.
Regional Administrator

EXECUTIVE SUMMARY
ENVIRONMENTAL IMPACT STATEMENT

DRAFT (X)
FINAL ( )

Prepared by : United States Environmental Protection Agency
Pacific Southwest Region IX
San Francisco, CA 94111

Type of Action: Administrative

Description of Project:

The purpose of the City of San Diego Metropolitan Facilities Plan is to determine and recommend the most cost-effective, socially and environmentally sound means of achieving, in the San Diego Metropolitan Area, the national water quality objectives as mandated by the Congress when they passed the Federal Water Pollution Control Act Amendments of 1972 (P.L.92-500).

The Facilities Plan analyzed a number of conceptual programs, subsystems, facilities components and sites before arriving at the following four recommendations for consideration by the San Diego City Council:

1. Continuation of primary treatment at the existing Point Loma sewage treatment plant with continued discharge of the effluent through the existing ocean outfall. Take steps to increase the capacity of the plant to 150 million gallons per day (MGD), with long-range planning calling for an ultimate capacity at Point Loma of 200 MGD.

2. Continuation of primary treatment and ocean disposal at the Point Loma facility and the construction of a 30 MGD biological secondary sewage treatment plant in Central San Diego with discharge of the effluent through the existing ocean outfall.

   In the second phase of the project, the Point Loma facility would be converted to a 45 MGD secondary treatment plant, and the Central San Diego plant would be expanded to treat a total of 155 MGD through biological secondary treatment.

3. Conversion of the Point Loma facility to provide 45 MGD of secondary treatment, with construction of a 105 MGD secondary sewage treatment plant in Central San Diego. In Phase II an additional 50 MGD of secondary sewage treatment facilities would be constructed at the Central San Diego site.

4. Split the Metropolitan Sewage System so that half the flow would be treated in the Central San Diego and Point Loma areas, while the remaining half of the flows would be treated in the South Bay area. In Phase I, 70 MGD of biological secondary sewage treatment capacity would be provided for the South Bay facility, with the effluent being discharged through a new ocean outfall off the mouth of the Tijuana River, while primary treatment would continue at Point Loma.

   In Phase II construction, the South Bay facility would be expanded to 100 MGD of secondary treatment while the Point Loma plant would be converted to a 45 MGD secondary treatment plant, and a new 55 MGD secondary treatment plant would be constructed in Central San Diego.

   The South Bay facility could be sized larger in the event that the City of Tijuana, Mexico decides to enter into an agreement with San Diego to have Tijuana's sewage treated by the new facility.

   The purpose of this EIS is to evaluate the alternatives as presented in the Metropolitan Facilities Plan, and to select a project on the basis of its analysis of the environmental, social and economic impacts of each alternative.

PROBLEM DESCRIPTION:

The existing metropolitan treatment system is faced with the following problems:

1. Capacity. The present average dry-weather flow (ADF) through the San Diego wastewater treatment facility at Point Loma is approximately 115 mgd (114.9 mgd ADF for January, February and March 1977), which is near the design capacity of 120 mgd; consequently, the design capacity of the treatment facility will be exceeded in the near future.

2. Requirements of the Federal Water Pollution Control Act (FWPCA) Amendments, PL 92-500, and the California Water Code, Division 7. The California Regional Water Quality Control Board - San Diego adopted waste discharge requirements (Order #74-50 and addendum No. 1) and National Pollutant Discharge Elimination System (NPDES) permit No. CA0107409 (Appendix A) for the San Diego-Point Loma wastewater treatment plant ocean outfall. NPDES permit requirements are set for each waste discharge to protect water quality; to implement

water quality control plans; and if the discharge is to the surface navigable waters of the United States to meet the requirements of the FWPCA (administered by EPA through the State). Addendum No. 1 of Order 74-50 delays compliance with the Order's more stringent standards from "after January 1, 1977" and "July 1, 1978" to the time when "...compliance with the secondary treatment standards of the EPA is achieved".

The FWPCA (PL 92-500) required that by July 1, 1977 all publicly-owned wastewater treatment facilities must utilize "secondary treatment" and if an industrial discharger sends its waste through a publicly-owned treatment works, certain "pretreatment standards" must be met. EPA defined the minimum level of effluent quality attainable by "secondary treatment" to be (CFR, Title 40, Chapter 1, Part 133):

> "Biochemical oxygen demand (BOD) (5-day) and suspended solids shall have 30-day mean values less than 30 mg/l and a 7-day mean value less than 45 mg/l or 85 percent removal whichever is more restrictive.
>
> "Effluent fecal coliform bacteria shall not have a geometric mean exceeding 200/100 ml over a 30-day period or 400/100 ml over a 45-day period.
>
> "The effluent values for pH shall remain within the limits of 6.0 to 9.0."
>
> Special provisions allow for some deviations to the above regulations.

A report prepared by Clean Water Conslutants and included in its entirety in the Lowry & Associates (1976) San Diego Metropolitan Facilities Plan report, Section 4.4.4, states that effluent currently (1975) discharged to the ocean substantially exceeds the future discharge requirements (Order #74-50) for chromium, BOD, suspended solids and grease and oil. The treated effluent slightly exceeds the future requirements for arsenic, cadmium, zinc and chlorinated hydrocarbon. The report further states that it appears that both secondary treatment and an industrial waste source control program will be necessary to achieve the 1978 discharge require--ments for BOD and suspended solids. The requirements for grease and oil could be achieved by secondary treatment while maintaining the industrial contributions at current (1975) levels. It does not appear possible to meet the future discharge requirements for chromium of 0.005 mg/l by control or even complete elimination of industrial dischargers. As indicated above, the requirements for secondary treatment are determined by EPA. Additional requirements (bacteria, physical characteristics, chemical characteristics, biological characteristics, toxicity, and radioactivity) are determined by the California State Water Resources Control Board and are listed in the Water Quality Control Plan, Ocean Waters of California (1972).

The City of San Diego wastewater treatment facilities system, therefore, has two problems associated with the federal law as expressed in the NPDES permit. First, they will not be in compliance with PL 92-500 because they do not have secondary treatment at their facility (required by July 1, 1977) and second, they cannot meet future discharge requirements. The compliance with future discharge requirements has been tied by Addendum No. 1 of the San Diego Regional Board's adopted waste discharge requirements (order #74-50) to implementation of secondary treatment.

3. City of Tijuana Wastewater. A third major concern of the San Diego region and the San Diego metropolitan wastewater treatment system is the untreated wastewater flow from the City of Tijuana, Baja California The San Diego metropolitan wastewater treatment system accepts emergency flows from Tijuana; however, emergency use comprises about 12 mgd on almost a daily basis. It is not known if any source control is practiced by Tijuana industries.

   The City of Tijuana is located in the Tia Juana River basin upstream from the Tia Juana River flood-plain and estuary which are on the United States side of the international border. Discharges of untreated wastewater from the Tijuana wastewater system to the Tia Juana River basin affect environmental conditions downstream (within the United States). To reduce hazards to public health and the estuarine and river ecosystems, the City of San Diego accepts emergency flows from Tijuana.

AREA AFFECTED:

The study area for this EIS encompasses what can be generally described as the San Diego metropolitan area. Specifically, the study area boundaries (Figure II-2) were designed to include all communities now receiving sewage disposal service through the San Diego metropolitan system or capable of receiving such service before the end of the century. Undeveloped lands with reasonable proximity and favorable topographic relationships to the existing system were included within the study area boundaries. The study area crosses the international border with Mexico to include the City of Tijuana, Baja California.

MAJOR ENVIRONMENTAL ISSUES:

Implementation of the San Diego Wastewater Treatment Facilities Plan requires consideration of environmental concerns in three different topic or issue areas. These environmental issues or concerns are presented below in a question format.

1. Marine Discharge of Primary Treated Sewage Effluent. What are the effects of discharge of primary treated wastewater on the marine ecosystem? What would be the effects of increasing the discharge of primary wastewater from 115 mgd to approximately 200 mgd over the next 25 years? In comparison, how would the implementation of secondary treatment alter the effects of the discharge on marine ecosystems?

2. Secondary Impacts of Growth. What will be the secondary impacts of population growth accommodated by increased wastewater treatment capacity? How will the physical, biological and socio-economic environment of the San Diego region be affected by almost doubling the capacity of the wastewater treatment facility (and thus accommodating almost twice the population)? How will local communities plan for and manage the impacts of growth unrestrained by wastewater treatment capacity?

and

3. Tijuana Wastewaters. What threats to United States lands and waters result from the discharge of Tijuana wastewaters into the Tia Juana River basin? Is providing some type of wastewater treatment to Tijuana necessary for the protection of United States lands and waters? If so, should it be part of the San Diego wastewater treatment facilities or a separate system? How could backup emergency or regular wastewater treatment be provided on the United States side of the border for the City of Tijuana?

THE EIS PROCESS

Preparation of an EIS on this project is required by several of the criteria stated in EPA's April 14, 1975, Final Regulations for the Preparation of Environmental Impact Statements. Basically, an EIS is required because the project is expected to have significant effects on the human environment, specifically water quality, land use, and air quality. Futhermore, the nature and value of these effects is at issue within the project area.

The purpose of this statement is to publicly present all issues surrounding the project's objectives including primary and secondary effects so that they can be resolved as openly and satisfactorily as possible. In keeping with this open policy, the EIS has been developed as part of a decision process to select the most desirable wastewater management alternative and to determine the appropriate system capacity in accordance with local, state, and federal objectives.

PREFACE

The goal of this Environmental Impact Statement (EIS) is to bring public participation and environmental review directly into the planning and decision-making processes. The two main purposes of this document are:

- To publicize and solicit comment on the long-range environmental and social effects of wastewater management decisions which must be made by the City of San Diego and various regulatory and funding agencies.
- To provide a comparison of planning alternatives so that citizens can comment and express concerns and preferences they may have.

The Draft EIR/EIS is being distributed in advance of public hearings scheduled during November 1977. Public comment on the alternatives presented herein is expected to play a key role in (1) selection of a long-range wastewater facility plan for the San Diego service area including size and type of collection and treatment facilities and (2) implementation of any mitigating measures needed to reduce environmental effects.

If you do not comment at the public hearings you may send written comments to EPA at the address listed below up to at least 30 days following the hearings.

Following the public hearings in November, the Draft EIS will be revised in light of public comments to form the Final EIS. All public response and planning decisions reached on the basis of the response will be included in the Final EIS.

PREPARATION OF THE EIS

LIST OF PARTICIPANTS

This Draft EIS was prepared under the auspices of the Environmental Protection Agency, Region IX. EPA staff was supported by the State Water Resources Control Board (SWRCB) and the independent consulting firm of Jones and Stokes Associates. Assistance was also provided by the Facilities Plan consultant, Lowry and Associates. The following persons participated in the development of this EIS:

EPA	
EIS Project Manager	Richard Williamson
SWRCB	
EIS Evaluator	Tom Inouye
Jones and Stokes Associates	
Project Manager	Dr. Charles Hazel
	Joanne Mensch
	Robert Sculley
Gruen, Gruen & Associates	Stan Mellin
	Suzanne Lampert
Don Owen & Associates	Frank Gehrke
Lowry & Associates	Dennis O'Leary
City of San Diego	Bill Roberts

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I. INTRODUCTION

The Environmental Impact Statement Requirement

The National Environmental Policy Act of 1969 (NEPA), implemented by Executive Order 11514 and the Council on Environmental Quality's (CEQ) Guidelines of August 1, 1973 (38 Federal Register [FR] 20550), requires that all agencies of the federal government prepare a detailed Environmental Impact Statement (EIS) on proposals for projects that may significantly affect the quality of the human environment. NEPA requires that agencies, in this case the Environmental Protection Agency (EPA), include in their decision-making process all considerations of environmental aspects of proposed actions, the environmental impacts of the proposed project and its alternatives, and a discussion of ways to avoid or minimize adverse effects. The EIS is to be a "full disclosure" document and must follow specific regulations of the EPA as contained in Code of Federal Regulations (CFR), 40, part 6, as published in the Federal Register, Volume 40, No. 72, April 14, 1975 (Appendix J). These EPA policies and procedures indicate the importance of explaining for "public understanding" the potential impacts of a proposed program or project and its alternatives and the importance of including public and governmental agency comments in the process.

The Federal Water Pollution Control Act, 1956, and Amendments, 1966, 1972 (Public Law [PL] 92-500), provided construction grant programs for public sewer system construction among their many provisions. The Act is administered by EPA. This EIS on the San Diego Wastewater Treatment Facilities Plan has been prepared by EPA to comply with NEPA requirements and PL 92-500 in providing grant funds to the City of San Diego for the proposed upgrading and expansion of their wastewater treatment facilities. Federal grants pay up to 75 percent of the costs of planning, designing and constructing wastewater treatment facilities.

Additional grant funds (12.5 percent) are provided under the California Clean Water Grant Program administered by the California State Water Resources Control Board (SWRCB). The SWRCB must comply with the California Environmental Quality Act (CEQA) of 1970 (Public Resources Code 21000 et seq.) which requires the preparation of an Environmental Impact Report (EIR) whenever significant environmental impacts will result from a project. The grant applicant, that is, the wastewater treatment agency, district or city must prepare the EIR for the SWRCB as a supporting document to the facilities plan.

Two separate environmental documents, a California (CEQA) required EIR and a federal (NEPA) required EIS, have been prepared for the San Diego Wastewater Treatment Facilities Plan. Information in the two documents is similar, which is to be expected considering the similarity of the environmental legislation and the fact that the two documents began as a single EIR/EIS. Differences in focus and approach to solving San Diego's wastewater treatment problems necessitated the separation of the joint document into two separate products.

The EIR, prepared by the City of San Diego, stresses the continued use of primary treatment in any expansion of wastewater treatment. In contrast, the EIS discusses means of providing secondary treatment for existing and expanded wastewater treatment facilities. The principal data and information sources for this EIS included the San Diego Metropolitan Facilities Plan Report prepared for the city by Lowry & Associates (1976, 1977); the San Diego Metropolitan Facilities Plan EIR/EIS prepared by S. El Wardani (1977); published literature; governmental agency reports; and letters of comment on the EIR.

The EIS and EIR both analyzed impacts dealing with the conceptual plans for wastewater treatment, reclamation and disposal. Neither environmental document dealt with the specific impacts of specific projects, but rather investigated the overall impacts of the program. Subsequent EIRs will be prepared for each facet of the wastewater program as specific projects are undertaken.

The Existing Wastewater Treatment System

The San Diego metropolitan system provides municipal and industrial wastewater treatment and disposal to the Cities of Chula Vista, Coronado, Del Mar, El Cajon, Imperial Beach, La Mesa, National City, Lemon Grove and San Diego; special districts serving unincorporated areas (Lakeside, Montgomery, Pomerado, Santee, Spring Valley, Rolando and Otay Municipal Sanitation Districts); and the U. S. Navy. Emergency sewerage service is provided to the City of Tijuana, Baja California, by diverting raw sewage from Tijuana into the metropolitan system during power outages and other system failures in the Tijuana treatment facilities.

Physical structures in the metropolitan system are owned and operated by the City of San Diego and capacity in the system is allocated on a contractual basis to the communities listed above. The San Diego Metropolitan Wastewater Treatment

System consists of two large interceptors which come together at Pumping Station No. 1 near Lindbergh Field before proceeding as a single interceptor to the Point Loma metropolitan treatment facility. The design capacity of the southern interceptor (15 miles in length) increases from 27.6 million gallons a day (mgd) at its southern terminus to 190.8 mgd at pumping station No. 1. The design capacity of the northern interceptor (2 miles in length) is 186.4 mgd. The interceptor from Pumping Station No. 1 to the Point Loma plant (5 miles) has a design capacity that varies from 337.8 to 360.3 mgd. These main interceptors are fed by a number of community and intercommunity interceptor systems.

The Point Loma wastewater treatment facility has a rated primary treatment capacity of 120 mgd with on-site sludge digestion. Stabilized sludge pumped to Fiesta Island in Mission Bay is dewatered and used as a soil amendment. Nondisinfected primary effluent is discharged to the ocean from an outfall 11,508 feet offshore. Design capacity of the outfall is 240 mgd average daily flow (ADF).

The existing metropolitan treatment system is faced with problems or potential problems related to:

1. Capacity. The present average dry-weather flow ADF through the San Diego wastewater treatment facility at Point Loma is approximately 115 mgd (114.9 mgd ADF for January, February and March 1977) which is near the design capacity of 120 mgd; consequently, the design capacity of the treatment facility will be exceeded in the near future.

2. Requirements of the Federal Water Pollution Control Act (FWPCA) Amendments, PL 92-500, and the California Water Code, Division 7. The California Regional Water Quality Control Board - San Diego Region adopted waste discharge requirements (Order No. 77-18) and National Pollutant Discharge Elimination System (NPDES) permit No. CA0107409 (Appendix A) for the San Diego-Point Loma wastewater treatment plant ocean outfall. NPDES permit requirements are set for each waste discharge to protect water quality; to implement water quality control plans; and if the discharge is to the surface navigable waters of the United States, to meet the requirements of the FWPCA (administered by EPA through the state).

   The FWPCA (PL 92-500) required that by July 1, 1977 all publicly-owned wastewater treatment facilities must utilize "secondary treatment" and if an industrial discharger sends its waste through a publicly-owned treatment works, certain "pretreatment standards" must be met. EPA defined the minimum level of effluent quality attainable by "secondary treatment" to be (CFR, Title 40, Chapter 1, Part 133:

> "Biochemical oxygen demand (BOD) (5-day) and suspended solids shall have 30-day mean values less than 30 mg/l and a 7-day mean value less than 45 mg/l or 85 percent removal whichever is more restrictive.
>
> "Effluent fecal coliform bacteria shall not have a geometric mean exceeding 200/100 ml over a 30-day period or 400/100 ml over a 45-day period.
>
> "The effluent values for pH shall remain within the limits of 6.0 to 9.0."
>
> Special provisions allow for some deviations to the above regulations.

A report prepared by Clean Water Consultants and included in its entirety in the Lowry & Associates (1976) San Diego Metropolitan Facilities Plan report, Section 4.4.4, states that effluent currently (1975) discharged to the ocean substantially exceeds the future discharge requirements for chromium, BOD, suspended solids and grease and oil. The treated effluent slightly exceeds the future requirements for arsenic, cadmium, zinc and chlorinated hydrocarbon. The report further states that it appears that both secondary treatment and an industrial waste source control program will be necessary to achieve the 1978 discharge requirements for BOD and suspended solids. The requirements for grease and oil could be achieved by secondary treatment while maintaining the industrial contributions at current (1975) levels. It does not appear possible to meet the future discharge requirements for chromium of 0.005 mg/l by control or even complete elimination of industrial dischargers. As indicated above, the requirements for secondary treatment are determined by EPA. Additional requirements (bacteria, physical characteristics, chemical characteristics, biological characteristics, toxicity, and radioactivity) are determined by the California State Water Resources Control Board and are listed in the Water Quality Control Plan, Ocean Waters of California (1972, 1977).

The City of San Diego wastewater treatment facilities system, therefore, has two problems associated with the federal law as expressed in the NPDES permit. First, they are not in compliance with PL 92-500 because they do not have secondary treatment at their facility (required by July 1, 1977) and second, they cannot meet future discharge requirements.

3. City of Tijuana Wastewater. A third major concern of the San Diego region and the San Diego metropolitan wastewater treatment system is the untreated wastewater flow from the City of Tijuana, Baja California. The San Diego metropolitan wastewater treatment system accepts emergency flows from Tijuana; however, emergency use comprises about 4.5 mgd on almost a daily basis. It is not known if any source control is practiced by Tijuana industries.

   The City of Tijuana is located in the Tia Juana River basin upstream from the Tia Juana River floodplain and estuary which are on the United States side of the international border. Discharges of untreated wastewater from the Tijuana wastewater system to the Tia Juana River basin affect environmental conditions downstream (within the United States). To reduce hazards to public health and the estuarine and riverine ecosystems, the City of San Diego accepts emergency flows from the City of Tijuana.

Objectives of the Proposed Wastewater Treatment, Reclamation and Disposal Plan

The stated objectives of the proposed Wastewater Treatment, Reclamation and Disposal Facilities Plan for the City of San Diego (Lowry & Associates, 1976, 1977) is to "develop a recommended plan for installation of treatment works and other sewerage facilities needed to comply with the above [SWRCB and EPA] directives". These directives were contained in the 1974 NPDES permit for the San Diego metropolitan discharge to the ocean and indicated: 1) primary sedimentation could be used until January 1, 1977, after which processing must be upgraded to an intermediate level for an interim period; 2) San Diego must prepare to convert to secondary treatment by the end of the interim period, in conformance with the mandate of PL 92-500 (final plans for construction of secondary facilities were to be completed by January 1, 1977).

Other stated objectives of the Facilities Plan were to: 1) provide a framework for planning environmentally sound and cost effective sewage reclamation/disposal facilities for the period 1975-2000; 2) to furnish the basis for a logical program for meeting national water quality goals of the 1980s; and 3) to comply with several California Coastal Commission conditions for approval of Sedimentation Basins No. 5 and No. 6 at the Point Loma plant. The sedimentation basins have been constructed and are operating.

The Facilities Plan identified and assessed a number of alternatives for wastewater treatment, sludge disposal, reclamation/recycling, industrial source control, salinity control, and other facets of a total wastewater management program. Out of many possible alternatives, three groups of alternatives or systems were recommended. These recommendations were prioritized.

When the SWRCB and EPA reviewed the Facilities Plan they found that the first choice recommendation was to expand the primary treatment capacity of the existing Point Loma facility, but not to add any secondary treatment. This recommendation would never comply with provisions of PL 92-500. The city asked for an exception to the secondary treatment requirements. The other two recommendations provided secondary treatment at various times in the future, but the earliest possible date would be in 1983. PL 92-500 requires public wastewater treatment facilities to have secondary treatment by July 1, 1977. One of the factors dictating the long implementation schedule for the recommendations that provided secondary treatment was the federal ownership of the proposed sites. Acquisition of a parcel could be a long process.

In order to find large, more easily acquired parcels, the city of San Diego was asked by the SWRCB to restudy several alternatives involving a "split" system where part of the system would be located in the Tia Juana River Valley. The city was also asked to review the ranking and weighing system used in the Facilities Plan to choose feasible alternatives and to reassess the various alternative systems presented in the Facilities Plan. The document resulting from the study was the Facilities Plan Addendum [(parts 14 through 21), 1977].

In restudying the alternatives and adjusting the ranking and weighing system to reflect different concerns, the recommendations were augmented (four recommendations) and modified to the following:

1. Recommendation 1 - First Choice. Continue primary treatment at Point Loma and increase capacity to 150 mgd with a Phase II expansion to 200 mgd. Consider reclamation of digested sludge on Miramar Naval Air Station if the present site (Mission Bay-Fiesta Island) is not available. Expand the City of San Diego industrial waste control program in keeping with source control programs of EPA and the SWRCB. When an effective salinity control program is operational, construct a 13 mgd biological, secondary sewage treatment plant (followed by filt

tion and disinfection) and facilities to distribute reclaimed effluent for landscape irrigation. Establish a wastewater reclamation demonstration/ research center at the existing Santee water reclamation facility. If, and when, studies prove favorable, implement the recycling of reclaimed water at a minimum of 100 mgd to the municipal water supply system. Advise the United States Section of the International Boundary and Water Commission that a new backup emergency system is needed for the City of Tijuana to prevent future large-volume surface flows of untreated sewage into the Tia Juana River and estuary and the ocean. Preliminary study indicates the program should include a treatment/ reclamation facility on the United States side of the border with the ability to pump reclaimed water back to Mexico, and a land and ocean outfall system with average daily dry weather flow capacity of 70 mgd to furnish alternative disposal during low or no reclaimed water demand.

2. Recommendation 2 - Second Choice. Continue primary treatment of up to 120 mgd at Point Loma. Construct a 30 mgd biological secondary sewage treatment plant at a central San Diego site. During Phase II (in operation by 1987) convert Point Loma to 45 mgd biological secondary sewage treatment plant and expand the central San Diego 30 mgd plant by 125 mgd of biological secondary treatment. Sludge, industrial waste control, reclamation and backup/ reclamation for Tijuana are the same as indicated in Recommendation 1.

3. Recommendation 3 - Third Choice. Two different alternative plans:

   a. Provide biological secondary sewage treatment plant (45 mgd) at Point Loma and at a central San Diego site (105 mgd). In Phase II add 50 mgd average daily dry-weather flow capacity of biological secondary treatment at central San Diego site.
   or
   b. Install 150 mgd biological secondary plant in central San Diego and expand to 200 mgd in Phase II.

   Sludge, industrial waste control, wastewater reclamation and Tijuana provisions would be as described under Recommendation 1 above.

4. Recommendation 4 - Fourth Choice. Construct a 70 mgd biological secondary facility in the South Bay area. Build a 40 mgd biological secondary facility for Tijuana. Construct a common land and ocean outfall for both facilities. Continue primary treatment at Point Loma. During Phase II convert Point Loma to a 45 mgd biological secondary plant, construct a 55 mgd biological secondary plant in central San Diego, expand the South Bay facility by 30 mgd and increase the capacity of the Tijuana facility to 90 mgd. Sludge, industrial waste control and wastewater reclamation provisions would be similar to Recommendation 1. A South Bay site would also be acquired for sludge disposal.

The Facilities Plan under Recommendation 1 is proposing to request grant funding under PL 92-500 to expand facilities that will continue to not be in compliance with federal and state laws and regulations such as PL 92-500.

Neither Recommendations 1 nor 2 above would comply with PL 92-500 for either the original NPDES waste discharge requirements or for the secondary treatment requirements.

Recommendation 3 would provide compliance with PL 92-500 except for the date of July 1, 1977 required for implementation of secondary treatment. The NPDES permit requirement for chromium would not be achieved under any of the recommendations.

Recommendation 4 could not meet the July 1, 1977 requirement for implementation of secondary treatment. The South Bay facility would have secondary treatment as soon as it was put into service, but the Point Loma facility would continue primary treatment until Phase II (approximately 1987).

A number of alternatives are presented in this EIS that satisfy the recommendation of providing biological secondary treatment for the San Diego metropolitan wastewater treatment system, but differ in sizing, phasing or plant siting from those in Recommendations 3 and 4.

This EIS looks in detail at some of the alternative projects which appear to comply with PL 92-500 and NPDES requirements. Recommendations 1 and 2 are explored in more detail in the Facilities Plan and in the EIR.

Major Environmental Issues

Implementation of the San Diego Wastewater Treatment Facilities Plan requires consideration of environmental concerns in three different topic or issue areas. These environmental issues or concerns are presented below in a question format.

1. Marine Discharge of Primary Treated Sewage Effluent. What are the effects of discharge of primary treated wastewater on the marine ecosystem? What would be the effects of increasing the discharge of primary wastewater from 115 mgd to approximately 200 mgd over the next 25 years? In comparison, how would the implementation of secondary treatment alter the effects of the discharge on marine ecosystems?

2. Secondary Impacts of Growth. What will be the secondary impacts of population growth accommodated by increased wastewater treatment capacity? How will the physical, biological and socio-economic environment of the San Diego region be affected by almost doubling the capacity of the wastewater treatment facility (and thus accommodating almost twice the population)? How will local communities plan for and manage the impacts of growth unrestrained by wastewater treatment capacity?

3. Tijuana Wastewaters. What threats to United States lands and waters result from the discharge of Tijuana wastewaters into the Tia Juana River basin? Is providing some type of wastewater treatment to Tijuana necessary for the protection of United States lands and waters? If so, should it be part of the San Diego wastewater treatment facilities or a separate system? How could backup emergency or regular wastewater treatment be provided on the United States side of the border for the City of Tijuana?

II. ENVIRONMENTAL SETTING -- PHYSICAL AND BIOLOGICAL ENVIRONMENT

Terrestrial Environment

Geographic Setting

The study area (Figure II-1) of the San Diego Metropolitan Wastewater Treatment, Reclamation and Disposal Facilities Plan EIS encompasses the southwestern one-quarter of San Diego County. The county occupies the southwestern corner of California and is bordered on the north by Orange and Riverside Counties, on the east by Imperial County, and on the south by the Republic of Mexico and on the west by the Pacific Ocean. San Diego County ranks eleventh in total area among California's 58 counties and third in population with 1,656,800 residents in January 1977 (California Department of Finance, 1977).

San Diego County's 70 miles of Pacific coastline extends from the international border with Mexico north to Orange County. San Diego Bay, protected by Point Loma on the north and Coronado Peninsula on the south, provides one of the world's best protected anchorages. The bay has 22 square miles of water surface. It is one of three natural deep-water harbors on the Pacific Coast and the first United States Pacific port of call north of the Panama Canal. Mission Bay, outlet of the intermittently flowing San Diego River, has been developed as a residential/recreational complex.

The study area for this EIS encompasses what can be generally described as the San Diego metropolitan area. Specifically, the study area boundaries (Figure II-2) were designed to include all communities now receiving sewage disposal service through the San Diego metropolitan system or capable of receiving such service before the end of the century. Undeveloped lands with reasonable proximity and favorable topographic relationships to the existing system were included within the study area boundaries. The study area crosses the international border with Mexico to include the City of Tijuana, Baja California.

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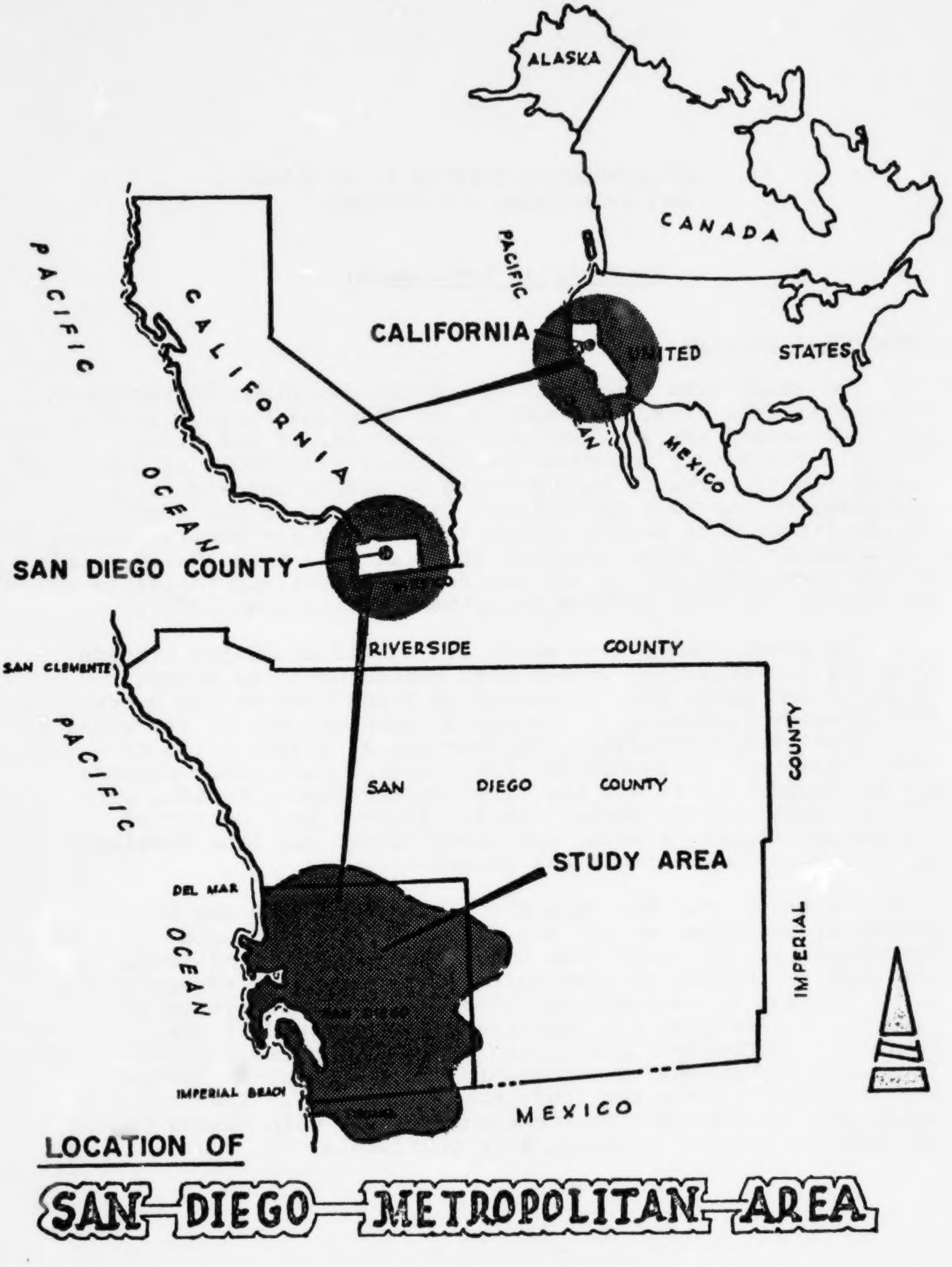
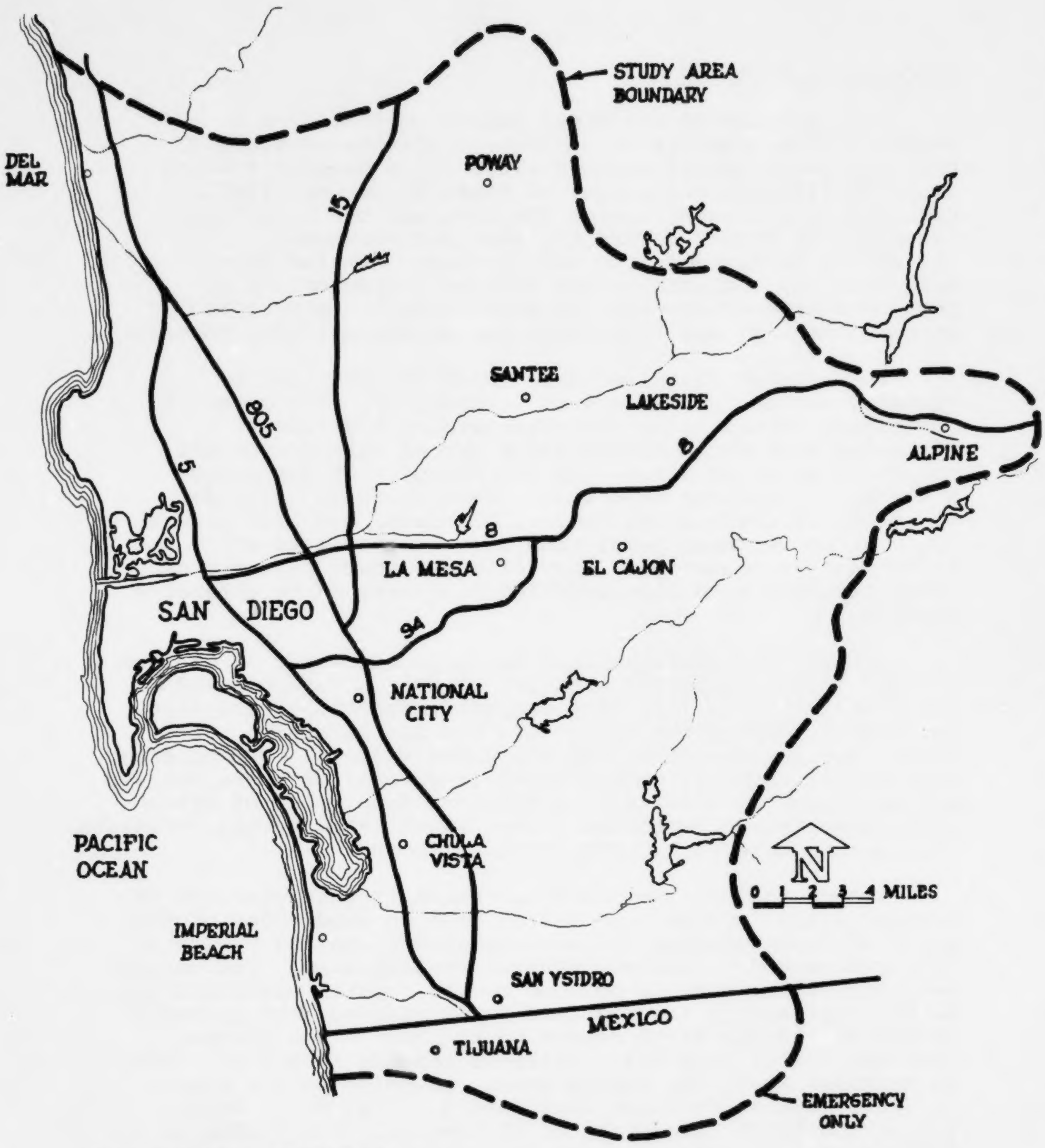


Figure II-1

Source: Lowry & Associates, 1976.



STUDY AREA
SAN DIEGO METROPOLITAN FACILITIES PLAN

FIGURE II-2

Source: Lowry & Associates, 1976.

Topographic Features

That portion of San Diego County which drains to the Pacific Ocean presents an asymmetric transverse profile having a long, gentle western slope and a steeper eastern slope (California Department of Water Resources, 1967). Highlands are present toward the east and the topography becomes less rugged toward the west and southwest. The region may be divided from west to east into two major sections: 1) a coastal plain section characterized by prominent marine wave-cut terraces, locally interrupted by stream channels; and 2) a dissected mountain-valley section.

The coastal plain section, which is underlain by Tertiary marine sediments with a relatively thin cover of Quaternary deposits, is characterized by a series of dissected wave-cut terraces which extend inland from the coast for about 10 miles. In the vicinity of San Diego a series of terraces have been formed on gently dipping sediments of Cretaceous, Eocene, Pliocene, and Pleistocene age. These terraces range from near sea level to about 1,200 feet in elevation. Many of the surface features of these terraces have been modified or destroyed by extensive erosion.

The coastal plain section has been dissected by various rivers which have formed a series of wide, flat-bottomed alluvium-filled valleys that provide important groundwater reservoirs. Among the larger are the San Dieguito, San Diego, Sweetwater, Otay, and Tia Juana Valleys. The apparent closure, or necking, of the mouth of several of these valleys may be caused by differential erosion, deposition of stream-carried materials (which have been accentuated by the formation of baymouth bars) or a combination of both.

The mountain-valley section, which is characterized by mountains and intermontane basins, can be subdivided on the basis of topographical differences into a central mountain-valley area and an eastern mountain-valley area. The central mountain-valley area is bounded by the coastal plain section on the west and by the Elsinore fault zone and the drainage divide of the San Diego region on the east. The central mountain-valley area has elevations ranging from 5,687 feet at Santiago Peak, the northernmost extension of the region, to 6,515 feet at Cuyamaca Peak, and 6,375 at Mount Laguna in the southeastern portion of the region. The floors of alluvium-filled valleys range from about 500 to 5,000 feet in elevation in a general step-like arrangement of alternative narrow and broad valleys. The broad basins are bypassed by the major westerly-flowing stream systems. Major plateaus exist in the area. Eastern portions of the EIS study area

(Figure II-3) are found in the western part of the central mountain-valley area. Study area elevations range from 0 to approximately 2,300 feet.

Geology and Soils

Geology. San Diego County lies within the Peninsular Ranges province of California, a well-defined geologic and physiographic unit, trending 900 miles southeastward from the Los Angeles Basin to Baja California. It is bounded on the northeast by the Transverse Ranges province, the Colorado Desert province, and the Gulf of California. The southwestern portion of the province lies beneath the Pacific Ocean, appearing as Santa Catalina, San Clemente, and other islands.

The northeastern portion of the Peninsular Ranges province is underlain mainly by Mesozoic igneous and metamorphic rocks which form northwestward-trending mountains. A coastal plain exists which is underlain by sedimentary rocks ranging in age from late Cretaceous to Miocene.

Structurally, the Peninsular Ranges province in the San Diego area is an uplifted block which has been tilted to the southwest and sliced into smaller blocks by major northwest-trending, dominantly right lateral faults. The fault-bounded blocks are further transected by lesser northwest-trending faults, and most are segmented by cross-faults.

Stratigraphy in San Diego County consists of Cretaceous and Tertiary marine, lagoonal, and fluviatile clastic strata which have accumulated in thicknesses as great as one-half mile. These rocks unconformably overlie rocks of the Cretaceous Southern California batholith and the pre-batholithic Jurassic Santiago Peak Volcanics.

Two distinct northwest-trending geomorphic provinces are represented within the study area -- a coastal plain province underlain by generally flat-lying marine strata and an interior upland province underlain by crystalline rocks.

The nearly rectangular-shaped coastal plain province contains the greater part of the study area. The coastal plain province ranges in from approximately seven miles at the northern boundary of the city near Del Mar, to approximately 14 miles at the southern boundary along the Mexican border. The province is composed of a nearly flat-lying

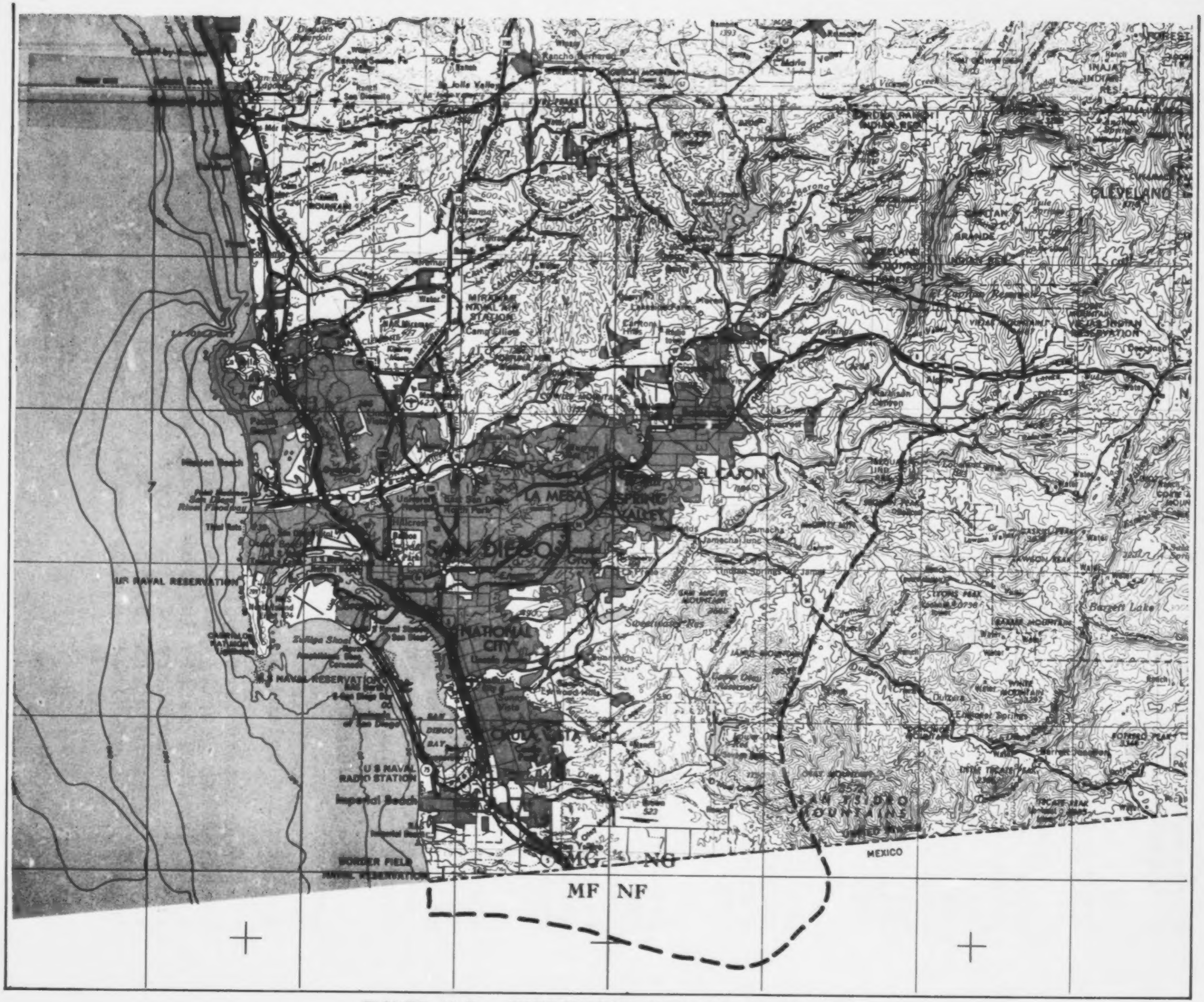


FIGURE II-3. TOPOGRAPHIC MAP – SAN DIEGO AREA

succession of predominantly marine sandstone, siltstone, mudstone and conglomerate ranging in age from Cretaceous to Pliocene. These sedimentary deposits are capped in many areas by marine terrace materials of Pleistocene to Recent age.

The Rosario Formation of Cretaceous age, crops out in the western parts of the coastal plain as a narrow belt extending from La Jolla and Mount Soledad areas to the tip of Point Loma. These Cretaceous rocks are the oldest sediments in the area.

Younger than the Rosario Formation and lying generally east of it, is a thick section of Eocene strata grouped into five formations that extend from the northern San Diego city boundary, south to National City, and east to the interior upland province. These formations, from oldest to youngest are: 1) Del Mar Formation, 2) Torrey Sandstone, 3) Rose Canyon Formation, 4) an unnamed sandstone-mudstone unit, and 5) Poway Formation.

The San Diego Formation, of Pliocene age, overlies the Eocene rocks and crops out from the southern flanks of Mount Soledad, south to the Mexican Border and east to the interior upland province. In the Otay Mesa area, the San Diego Formation is interfingered and partly covered by Plio-Pleistocene rocks.

Marine terrace deposits of late Pliocene to Recent age once covered the greater part of the coastal plain province. Remnants of this cover still cap much of the older sedimentary rock, giving rise to mesa-like topography.

The sediments of the coastal plain lie in profound unconformity upon the older rocks of the interior upland province. The upland province trends north-south through the eastern fringes of San Diego city, extending from Lake Hodges to Black Mountain, south to the Murray and Lower Otay Mesa Reservoir areas. The Cretaceous and older crystalline rocks that form the upland province consist of metamorphosed volcanic flows and shallow intrusive rocks ranging in composition from metadacite to metaandesite. Granitic rocks of Cretaceous age, ranging in composition from tonalite to gabbro, intrude the volcanic rocks but crop out mainly east of them. Pre-Eocene uplift and extensive deformation of the entire granitic-volcanic complex formed the steeply tilted and highly fractured rocks of the interior upland province.

The geology in the vicinity of the existing wastewater treatment facilities is related to the topography of the land. Originally tidelands, the area in the vicinity of Pumping Station No. 2 (west of Lindbergh Field) and along Harbor Drive to Scott Street has been reclaimed by placing hydraulic fill during dredging operations in San Diego Bay. Beyond Scott Street, the ground rises gradually to the base of the Point Loma Hills. In past geologic time, a marine terrace known as the Linda Vista Formation was deposited against the older underlying sediments of Point Loma. This terrace overlies the older irregular erosion surface and has numerous wave-cut benches. From Scott Street to the Point Loma hills, the terrace deposit consists predominantly of sandy clay and clayey sands. Generally the upper profile of the terrace deposit is of more cohesive soil, grading into more granular materials with depth. The hills of Point Loma consist of very dense, fine to medium grained sandstone with thin siltstone interbeds. This formation, commonly referred to as the Rosario Formation, is one of the oldest sedimentary deposits underlying the San Diego area.

Maps of regional and specific area geology may be found in California Mines and Geology (1963), Geology and Mineral Resources of San Diego County, California and California Mines and Geology (1975), Geology of the San Diego Metropolitan Area California (Del Mar, La Jolla, Point Loma, La Mesa, Poway and SW 1/4 Escondido, 7-1/2 minute quadrangles).

Geologic Hazards. Slope stability is affected directly by the physical nature of the layered rocks, internal fabric of the rocks, topography, and natural and man-made erosion. Loosely consolidated sediments, because of their inherent weakness, fail by landsliding much more readily than well-consolidated rocks. Many of the Eocene and Pliocene sandstone and conglomerate units in the Mission Valley, Otay Mesa, Poway, and National City areas are examples of this inherent instability and are subject to landsliding if improperly excavated.

Hazards related to natural topographic features in the City of San Diego generally exist along the steep canyon boundaries bordering mesa-like areas. Naturally over-steepened slopes that commonly occur below resistant rims of marine terrace material are potential landslide areas. Locally, sediments of the Eocene Torrey Sandstone and Rose Canyon Formation have been eroded into vertical walls as high as 100 feet. These cliffs eventually yield to gravity, resulting in rock falls or debris avalanches. Examples of landsliding resulting from over-steepened topography are the Eocene cliffs between Scripps Institute and Torrey Pines State Park.

Slope stability hazards related to erosional processes may occur as a result of surface runoff and heavy rainfall, causing excavation and undercutting of soft permeable materials. Slopes exposed to runoff require adequate diversion drains, brow ditch areas, and adequate planting. Wave erosion along the sea coast of Torrey Pines State Park, La Jolla, Sunset Cliffs, and Point Loma also causes over-steepened slopes which are subject to landsliding. Landward erosion due to wave attack is exceptionally rapid along fractures at the base of cliffs and is presently causing a great loss of property (U. S. Congress, 1966).

The largest losses of life and property in California due to geologic hazards have been caused by violent ground shaking during earthquakes (California Division of Mines and Geology, 1973).

The County of San Diego *Draft Seismic Safety Element* states:

> "San Diego County is located in a region with significant seismic, geologic hazards including the San Jacinto and Elsinore Fault systems."

The City of San Diego *Seismic Safety Element* described the regional setting thus:

> "In San Diego, exposures are generally poor and faults are both potentially active and inactive, which makes it difficult to define the trace of potential displacement.
>
> "...the maximum probable earthquake (that is, the event of greatest magnitude that might occur with a fairly high order of probability) for both the San Jacinto and the Elsinore fault zones is between M (Magnitude) 6.9 and 7.3, with a repeat interval of approximately 100 years. The maximum credible earthquake for both fault zones is estimated at M 7.6.
>
> "There are no known active faults in the San Diego region with which such probable earthquake can be associated; however, there are two potentially active fault systems within the San Diego Region having sufficiently verified length to produce large magnitude earthquakes. These fault systems, the Rose Canyon and La Nacion, could produce credible events of approximately M 7.1 and 6.7, respectively. While it seems unlikely that an event of such magnitude will occur, the damage resulting from it would be especially severe in Urban San Diego."

The coastal plain in general has undergone little structural deformation. It has been only gently tilted and locally folded and faulted. Several north-to-northwest and northwest-to west-trending fault zones (Figure II-4) extend through parts of the coastal plain. The largest of these faults, designated the Rose Canyon Fault, displaced Eocene rocks in Rose Canyon and Mount Soledad. Otay Valley has formed along a fault which is at least several miles in length and of Pliocene age. Eocene and Pliocene sediments in Mission Valley and some of its tributaries between the Coast Highway and California State University at San Diego are locally steeply folded, due possibly to a system of faults trending east-west through Mission Valley. Nearly all of the faults mapped in the San Diego area are covered by successions of Pleistocene and younger sediments that have not been disturbed by faults; this indicates that these faults in most cases are pre-Pleistocene in age and presently inactive.

Rose Canyon, Mount Soledad, and parts of La Jolla represent an area of moderate structural deformation. The Cretaceous rocks which generally dip gently northeast are folded at Mount Soledad forming an east-trending anticline. The beds on the north limb dip between 40 and 85 degrees, whereas those of the south limb dip between 25 and 40 degrees. The Eocene rocks of this locally deformed area also are extensively folded and fractured and dip as steeply as 60 degrees.

Forty-four earthquakes of Richter magnitude 2.5 to 3.7 (M 2.5-3.7) have been recorded within the greater San Diego area since 1950. Earthquakes originating outside the San Diego area which caused local damage included the 1933 Long Beach earthquake (M 6.6) and earthquakes along the Valecitas-San Miguel (M 5.7, 6.8) and Agua Blanca (M greater than 5) faults of Baja California (California Division of Mines and Geology, 1975b). Large-scale maps showing faulting in the San Diego area can be found in references of the California Division of Mines and Geology (1963, 1975a, 1975b).

The potential for tsunamis or seismic sea waves exists for the San Diego coastline within and adjacent to the study area. San Diego and Mission Bays are mapped as showing "moderate potential damage from high water and swift currents" with high recurrence. Areas north of Mission Bay and south of San Diego Bay are shown as "low damage potential, but potentially unsafe during tsunami alert (California Division of Mines and Geology, 1973).

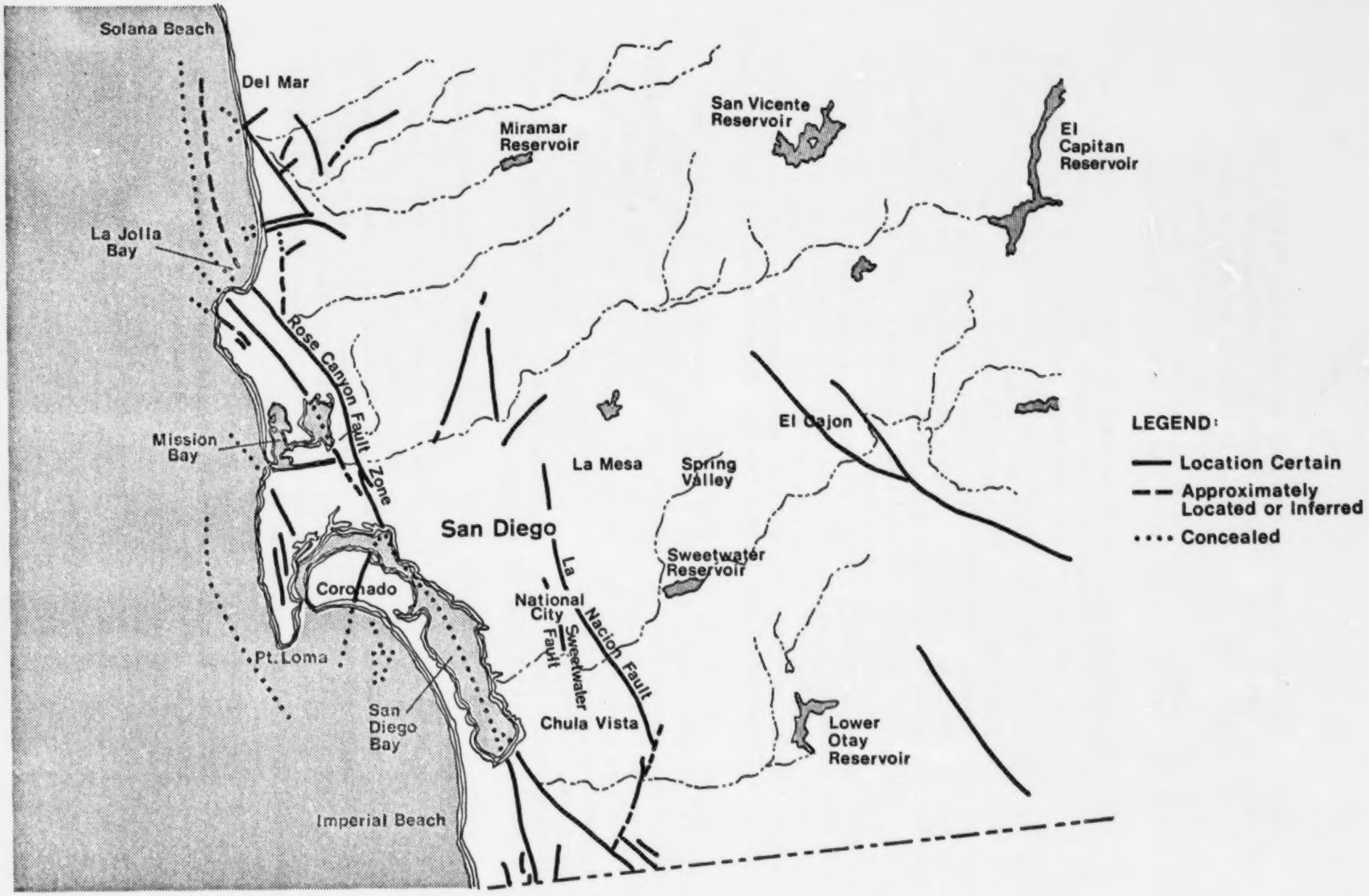


FIGURE II-4 FAULTS IN SAN DIEGO AREA

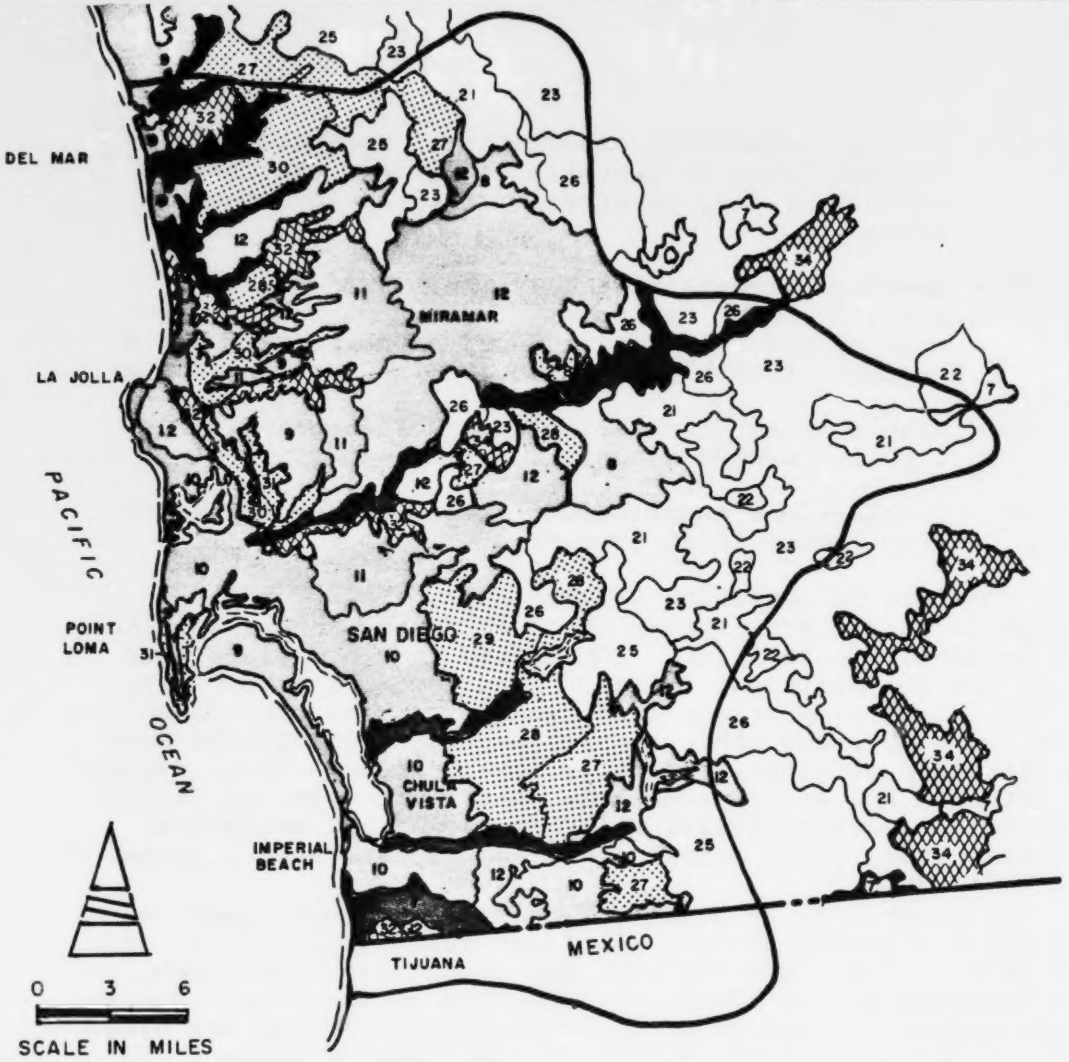
The San Diego area is mapped as showing "high" or "medium" expansiveness rating for the predominant soil type in the general area (California Division of Mines and Geology, 1973). If expansive soils are recognized as a potential geologic hazard on a specific site, corrective measures can be designed into the building foundation.

Mineral Resources. A detailed accounting of the mines and minerals of San Diego County can be found in the California Division of Mines and Geology publication Geology and Mineral Resources of San Diego County, California, 1963. Most of the mines in the area are inactive. San Diego County contains a large variety of minerals within its borders. The most widely known resources include gold and gem minerals such as tourmoline, garnet, beryl and lepidolite. Other important deposits include dimension stone, clay and prophyllite. Sand and gravel materials represent the most productive type of mining in San Diego County both in dollar value and tonnage. Actively mined mineral resources of the study area are primarily sands, gravels, decomposed granite and aggregate (California Division of Mines and Geology, 1975a. Mineral resource inventories are made annually by the Natural Resources Division, San Diego County Department of Agriculture.

Soils. Soils of the San Diego metropolitan area, as well as in the remainder of San Diego County, have been studied and described in detail by the USDA Soil Conservation Service and Forest Service (1973). The report discusses soils characteristics in terms of use of the soil for urban purposes, subsurface sewage disposal, mining of construction materials, recreation, wildlife habitat, farming and ranching. Maps depicting soil types throughout the county were prepared at a scale of 1:24,000 on aerial photographs.

Figure II-5 presents soil associations of the San Diego metropolitan area as set forth in the Soil Conservation Service report. Most of the associations shown fall into sandy clay loam to clay loam categories, well-drained to moderately drained. Alluvial areas within the usually narrow river valleys are made up of sandy loams. Soil associations 7, 10, 12, 27, 28 (Figure II-5) support or have the potential to support the agricultural operations within the study area. These soils are described as follows:

7 - Visalia-Tujunga association: Moderately well-drained and exclusively drained sandy loams to sands on alluvial fans and alluvial plains; 0 to 9 percent slopes.



■ EXCESSIVELY DRAINED TO MODERATELY WELL-DRAINED, NEARLY LEVEL TO MODERATELY SLOPING LOAMY SANDS TO CLAYS ON ALLUVIAL FANS AND ALLUVIAL PLAINS IN FOOTHILL AND COASTAL PLAIN AREAS.

▒ SOMEWHAT EXCESSIVELY DRAINED TO MODERATELY WELL-DRAINED NEARLY LEVEL TO STEEP LOAMY COARSE SANDS TO CLAY LOAMS ON TERRACES IN FOOTHILL AND COASTAL PLAIN AREAS.

□ EXCESSIVELY DRAINED TO MODERATELY WELL-DRAINED, GENTLY SLOPING TO VERY STEEP SANDY LOAMS TO SILT LOAMS ON UPLANDS IN FOOTHILL AREAS,

░ WELL-DRAINED AND MODERATELY WELL DRAINED, MODERATELY SLOPING TO VERY STEEP LOAMY FINE SANDS TO CLAYS ON UPLANDS IN COASTAL PLAIN AREAS.

▨ STEEP AND VERY STEEP DISSECTED LAND, ESCARPMENTS, AND GULLIED LAND. DOMINANTLY EXPOSED BEDROCK AND VERY LARGE BOULDERS.

NUMBERS DELINEATED ABOVE ARE "SOIL ASSOCIATIONS" AS SHOWN ON THE "GENERAL SOIL MAP OF SAN DIEGO AREA", PER U.S.DEPT. OF AGRICULTURAL SOIL CONSERVATION SERVICE, PUBLISHED 1971. THESE "SOIL ASSOCIATIONS" ARE AS FOLLOWS:- 6. SALINAS-CORRALITOS. 7. VISALIA-TUJUNGA. 8. RAMONA-PLACENTIA. 9. MARINA-CHESTERTON. 10. HUERHUERO-STOCKPEN. 11. REDDING. 12. REDDING-OLIVENHAIN. 20. FALLBROOK-BONSALL. 21. FALLBROOK-VISTA. 22. LAS POSAS. 23. CIENEBA-FALLBROOK. 25. EXCHEQUER-SAN MIGUEL. 26. FRIANT-ESCONDIDO. 27. DIABLO-ALTAMONT. 28. DIABLO-LINNE. 29. DIABLO-LAS FLORES. 30. LAS FLORES-HUERHUERO. 31. GAVIOTA-HAMBRIGHT. 32. ROUGH BROKEN LAND-TERRACE ESCARPMENTS-SLOPING GULLIED. 34. ROCK LAND.

SOIL ASSOCIATIONS OF THE METROPOLITAN AREA

FIGURE II-5

Source: U. S. Department of Agriculture (Soil Conservation Service) and Forest Service, 1973.

10 - Huerhuero-Stockpen association: Moderately well-drained loams to gravelly clay loams that have a subsoil of clay or gravelly clay; 0 to 9 percent slopes.

12 - Redding-Olivenhain association: Well-drained gravelly loams and cobbly loams that have a subsoil of gravelly clay and very cobbly clay over a hardpan or cobbly alluvium; 9 to 50 percent slopes.

27 - Diablo-Altamont association: Well-drained clays, 5 to 15 percent slopes.

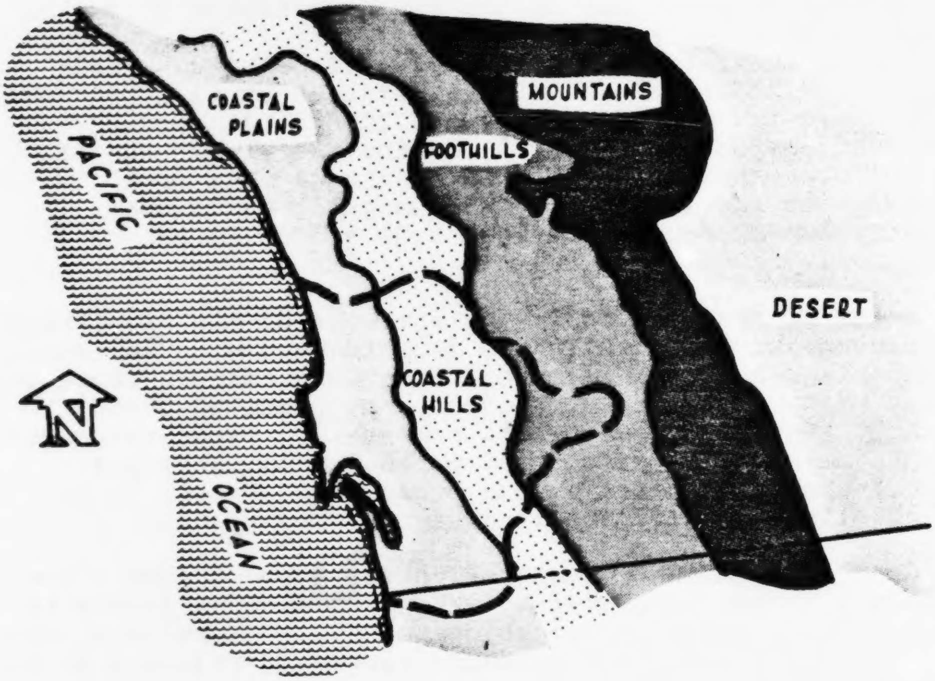
28 - Diablo-Linne association: Well-drained clays and clay loams; 15 to 50 percent slopes.

The Soil Conservation Service has another system for categorizing soils; a system of classifying land related to its productive capability. Identified in these classifications are the different kinds of land, vegetal cover, type of use, climate, physical land factors such as type of soil, erosion, slope, and other locally important conditions such as direction of slope, salinity, alkali accumulation, degree of wetness, and overflow hazard. Lands with similar characteristics, use possibilities, limitations, and management problems are grouped into one of eight established classes.

Although a diverse pattern of soils emerges based on the eight classifications, the first three (Class I, II and III soils), which are the best for agricultural purposes, are dominant in the broad river valleys of the area. Nearly three-fourths of the land in the Sweetwater, Upper San Diego, and San Dieguito River valleys is comprised of Class I, II and III soils. Major areas of Class I, II and III soils within the study area include the lower Tia Juana River flood plain, Otay (both Otay Mesa south of Brownfield and north of the Otay River), the Lakeside area, and the Jumal area. Many small "pockets" of Class I, II and III are found along stream valleys throughout the area. Exact locations can be ascertained from the soil survey of the area.

Climate

Climatic features of San Diego County are largely controlled by the semi-permanent Pacific high pressure cell, an area of subsiding air between California and Hawaii. The eastern portion of this air mass is characterized by a strong temperature inversion, with a base height varying from less than 400 to 5,000 feet. The frequency of low inversions is greatest in fall and winter. San Diego County's weather is characterized by few clouds, light winds, and in the coastal plain (Figure II-6), by moderate temperatures with annual and diurnal variations of less than 15°F from the average of 61°F.



CLIMATIC ZONES

FIGURE II-6

Source: Lowry & Associates, 1976.

Typical temperature data for the coastal region at a station in the City of San Diego are presented in Table II-1. Monthly mean temperatures range from 55.0°F in January to 71.8°F in August. The annual mean temperature is 63.2°F and recorded extremes are 106°F in September and 29°F in January. Precipitation, occurring mostly from September to April, has an annual mean of 10.40 inches, while the greatest recorded monthly and annual precipitation has been 6.26 and 24.93 inches, respectively. The average annual precipitation for the San Diego region is shown in Figure II-7.

Typical temperatures in the foothill region at a station in El Cajon are presented in Table II-1. Monthly mean temperatures range from 51.9°F in January to 73.3°F in August, with an annual mean temperature of 62.2°F, recorded extremes are 113°F in September and 20°F in January. Precipitation, occurring mostly during the winter months from December through March, has an annual mean of 13.08 inches, while the largest recorded monthly and annual precipitation extremes have been 8.08 and 28.14 inches respectively.

Rates of evaporation in the environs of San Diego vary with season and distance inland from the ocean. Peak rates are experienced at all locations from June through September of each year, while minimums occur from December through February. During dry San Diego summers, rates of evaporation increase markedly as distance from the ocean increases. Winter evaporation rates on the other hand, appear to be well equalized, regardless of distance from the coast.

Generally, monthly evaporation rates range from a low of about 2 inches in winter to a high of about 9 inches in summer. Total annual evaporation for the metropolitan area and its surrounding rural lands is generally regarded to be about 60 inches.

Persistent winds occur in the summer, when the land-sea breeze regime dominates the coastal areas. Breezes are light, 5 to 12 miles per hour and rapidly diminish with distance from the coast. Stream lines for the area indicate generally a land breeze from the easterly quadrants during night and early morning hours and daytime winds predominantly from the western quadrant.

The wind blows most frequently from the west and northwest (Figure II-8). Between the months of September and March, northerly and northeasterly breezes are frequent, while southwesterly and southerly breezes are common between April and June.

Table II-1

CLIMATOLOGICAL DATA

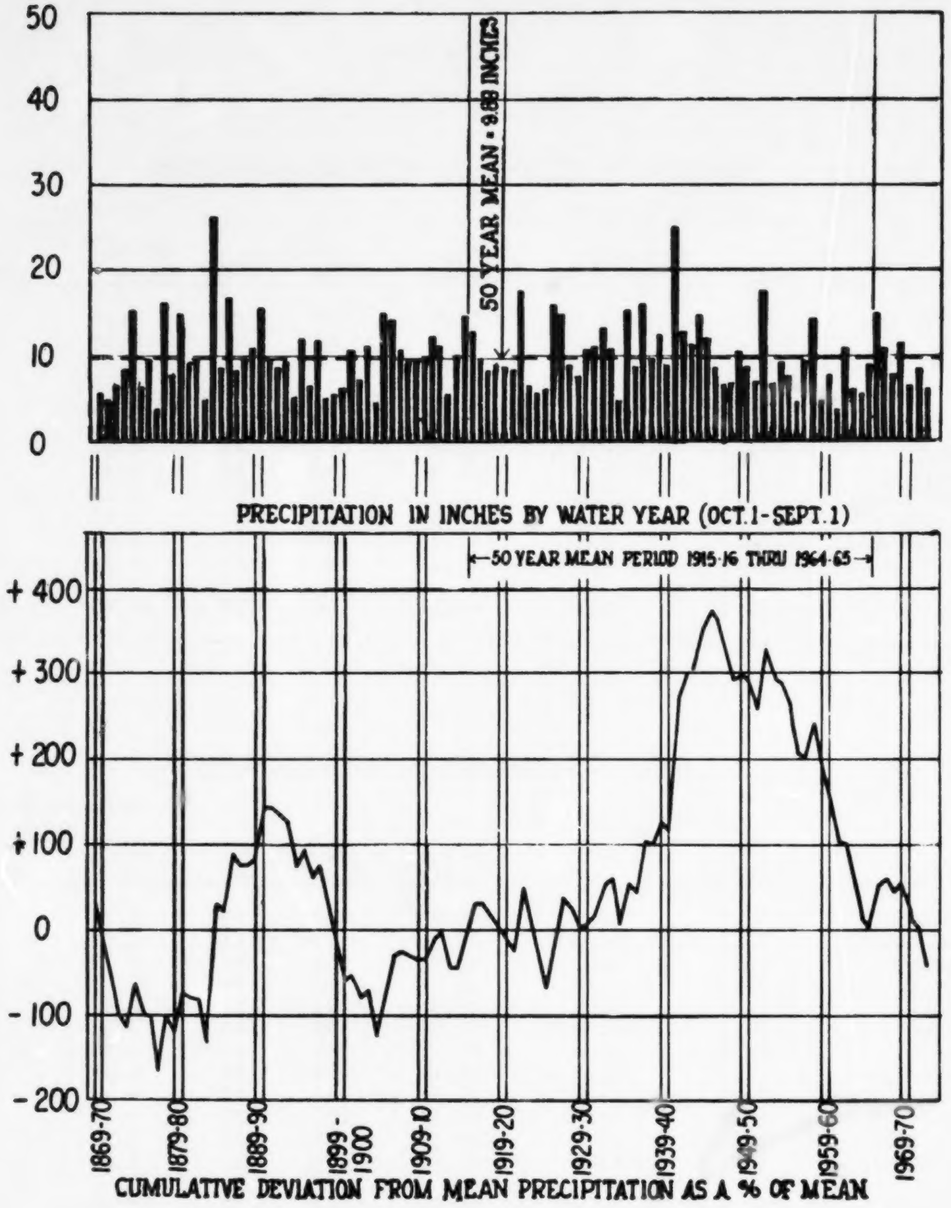
Coastal Region (Station-San Diego, California)

	Temperature, °F					Precipitation, Inches	
Month	Monthly	Mean Daily Maximum	Daily Minimum	Extremes High	Extremes Low	Monthly Mean	Monthly Maximum
January	55.0	64.6	45.4	92	29	2.01	6.26
February	56.2	65.4	46.9	88	36	2.15	5.31
March	59.0	67.7	50.2	90	40	1.57	5.89
April	61.5	69.2	53.8	95	41	0.79	3.58
May	64.0	70.9	57.0	96	47	0.15	0.88
June	66.2	72.6	59.8	97	50	0.05	0.28
July	70.1	76.8	63.4	93	55	0.01	0.16
August	71.8	78.0	65.5	98	57	0.08	0.87
September	69.9	77.6	62.2	106	51	0.15	2.58
October	66.1	74.4	57.8	98	45	0.49	2.90
November	61.8	72.1	51.4	96	38	0.90	5.82
December	57.1	67.0	47.2	85	35	2.05	7.60
Annual	63.2	71.4	55.1	106	29	10.40	24.93

Foothill Region (El Cajon, California)

	Temperature, °F					Precipitation, Inches	
Month	Monthly	Mean Daily Maximum	Daily Minimum	Extremes High	Extremes Low	Monthly Mean	Monthly Maximum
January	51.9	67.0	36.7	92	20	2.41	7.13
February	53.4	68.0	32.8	93	24	2.57	7.68
March	55.6	70.2	40.9	93	26	2.23	8.08
April	59.8	73.5	46.1	105	29	1.19	6.10
May	63.3	76.7	49.9	101	36	0.46	3.69
June	67.3	81.0	53.6	105	40	0.07	0.88
July	72.8	88.0	57.6	110	44	0.04	0.20
August	73.3	88.2	58.4	111	44	0.15	1.92
September	71.6	87.5	53.6	113	42	0.23	5.03
October	65.2	81.4	48.9	107	33	0.58	3.13
November	58.4	76.5	40.2	98	25	0.93	4.02
December	54.0	70.5	37.5	95	21	2.22	7.59
Annual	62.2	77.4	47.0	113	20	13.08	28.14

Source: University of California, 1970.



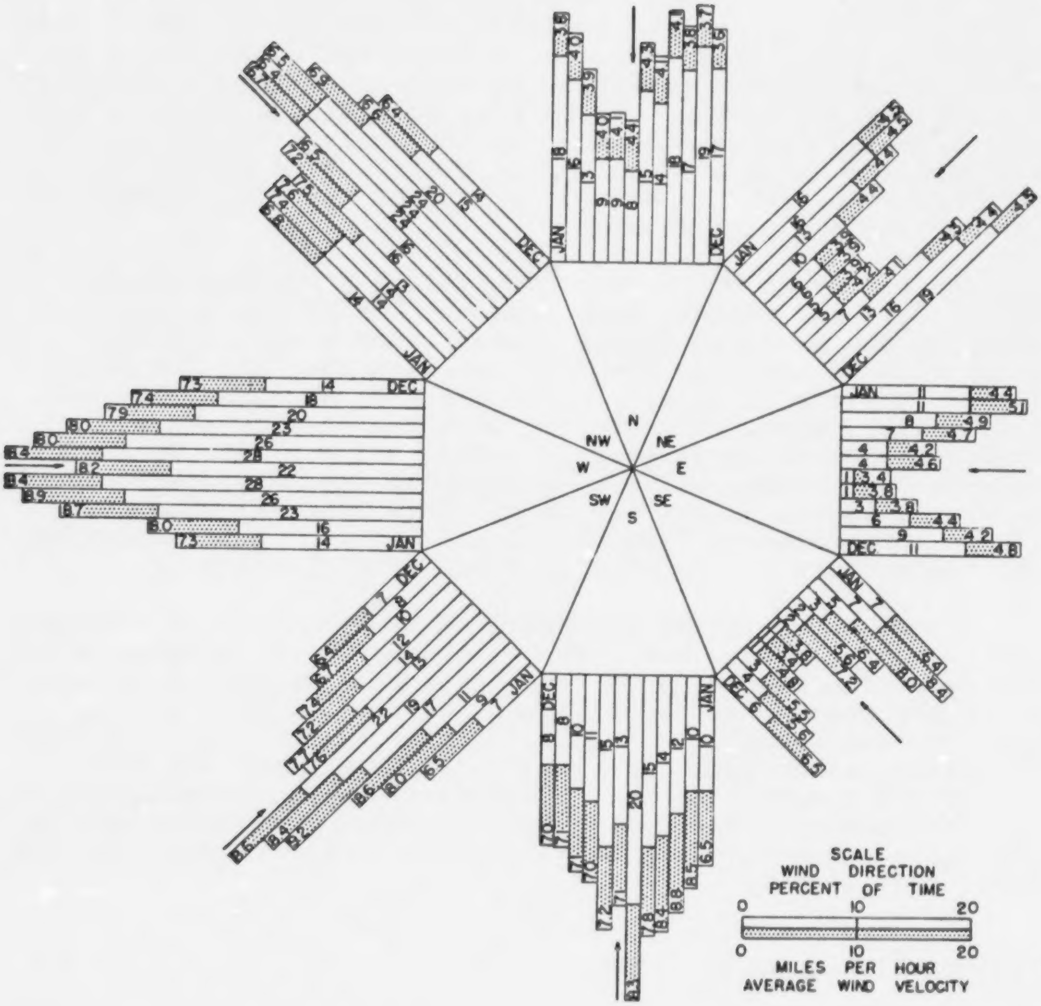
REPRESENTATIVE

PRECIPITATION CHARACTERISTICS

FOR SAN DIEGO

FIGURE II-7

Source: Lowry & Associates, 1976.



TYPICAL
ANNUAL WIND PATTERNS
AT LINDBERGH FIELD FIGURE II-8

Source: Lowry & Associates, 1976.

Winds are generally light, and near the coast they reflect the large-scale circulation of the nearby ocean area. Inland, however, local terrain is often the dominant factor, and wind directions are likely to conform to the direction of the valleys and ridges. As in most mountainous areas, there is a tendency for wind to move up the valleys during the day and down the hills and valleys at night. Wind speeds are light to moderate. Almost 95 percent of the wind speeds fall in the range of 0 to 12 mph.

At intervals of three or four times per year, usually in the fall and winter, high pressure conditions in the interior southwestern United States cause a very strong, gusty flow of air from the north or east into the San Diego area. This air is usually quite dry and, at times, may be unseasonably warm. Circulation is often shallow and hence is responsive to local terrain. One area may receive 30-mile-an-hour winds, while a neighboring locality one-fourth mile away may be relatively calm. This singular wind condition that deviates from the normal air flow pattern during the cooler part of the year is known as a "Santa Ana".

Cloud cover in the coastal area is basically an evening-night, early morning overcast, which rapidly dissipates after sunrise. The coastal area receives some 3,200 hours of sunshine per year or about 70 percent of the possible total, with amounts increasing inland. Winter storms are infrequent, resulting in sunshine percentages that are about the same winter and summer. Along the immediate coast, sunshine percentages actually decrease slightly during the summer due to nighttime and early morning cloudiness typical of most of the California coast.

Biological Resources

Biotic Communities. The Natural Resources Inventory of San Diego County (San Diego County Environmental Development Agency, 1973) identifies four major native terrestrial wildlife habitats and their associated biotic communities.

The most extensive wildlife habitat in the San Diego area is chaparral, a collection of xeric (drought-tolerant), leathery-leaved evergreen shrubs and dwarf trees, usually less than ten feet in height. Chaparral is a fire-adapted plant community with species capable of germinating and/or stump-sprouting after a fire. In San Diego County, chaparral is best developed between 1,000 and 4,000 feet. Numerous plant species thrive in the chaparral ecosystem; the specific composition of the flora varies with altitude and exposure, but chamise, scrub oak, wild lilac, toyon, sugarbush and manzanita are usually present. Mule deer commonly inhabit chaparral areas during winter, but migrate to higher altitude during summer. Fauna, suited to the semi-arid "Mediterranean" climate (warm, dry summers -- cool, moist winters) in which chaparral vegetation flourishes, include coyote, opossum, brush rabbit, a diverse avifauna with representatives of game birds, songbirds and predatory birds, and a host of small rodents and reptiles.

A zone of coastal scrub habitat extends from the chaparral-covered foothills to the ocean borderland, covering the undeveloped portions of coastal mesas. Coastal scrub vegetation, generally less dense than chaparral, is characterized by California sagebrush, white sage, black sage and California buckwheat interspersed with various shrubs and herbs also found in chaparral. Sparrows, wrens, buntings, hummingbirds, owls and an assortment of mammalian, amphibian and reptilian species utilize this habitat. Massive groves of the introduced gum tree, Eucalyptus, are scattered throughout the coastal and foothill areas.

Sand dunes and sandstone bluffs adjacent to the ocean are carpeted by a group of plants adapted to this dry, wind-swept coastal habitat. This coastal strand vegetation is composed of low-growing perennial succulents, such as shore sandburr, lupine, saltbush and iceplant. Few indigenous mammals occur, but coastal strand habitat offers an excellent nesting ground for shorebirds.

Most of San Diego's streams are ephemeral, with running water only after winter rains. Except where stream beds have been intentionally impounded to create reservoirs, significant amounts of aquatic vegetation are absent. Well developed stands of riparian woodland occur where the underground water table lies near the surface, allowing the growth of trees such as sycamore, willow, cottonwood, elderberry and poplar. Riparian vegetation supports an abundant and diverse biota, including mule deer, bobcat, raccoon, striped skunk, dusky-footed woodrat, belted kingfisher, woodpeckers, warblers, sparrows, hawks, and a variety of amphibians and reptiles. Riparian woodland, ranked among the highest quality wildlife habitats in southern California, is rapidly declining in San Diego County. Permanent ponds within river channels, such as those along the San Diego River in Mission Gorge and Mission Valley, support freshwater marsh communities which are of great importance as resting and feeding stops for migratory birds. Coastal wetlands will be discussed in the "marine" section.

Recreationally important terrestrial wildlife resources of the San Diego area are: 1) cold water fish species (trout, planted in local waters), 2) warm water fish species (bass, catfish, sunfish and crappie, introduced into reservoirs), 3) big game (mule deer), 4) upland game (quail, doves, pigeons, wild turkey [introduced], pheasant, rabbits and squirrels), and 5) water-associated birds (ducks and geese).

A wildlife habitat which is no longer represented by native species is the grassland. Most of the common grass and forb species were introduced from the Mediterranean region of Europe, and with the coming of European man, replaced native perennial species. Species such as filaree, fescue, cheat grass, soft chess and other brome grasses dominate in grassland area. Many grassland areas have become agricultural areas or urban developments. Grasslands are most valuable to wildlife as feeding areas, particularly where the grassland borders shrub, riparian or forest habitat types.

Ecologically-Sensitive Resources. The California Native Plant Society's publication, Inventory of Rare and Endangered Vascular Plants of California (1974) identifies a number of species deemed rare or endangered which occur within or directly adjacent to the boundaries of the study area. An "endangered" plant is "one threatened with extinction and is not likely to survive if causal factors now at work continue operating". A "rare" plant is "one that exists in only one or a very few restricted localities, occurs in such small numbers that it is seldom seen or collected regardless of its total range, or exists only on a type of habitat that could disappear or change for any reason".

The rare and endangered plant species of the San Diego area are identified in Table II-2 by scientific and vernacular names, rarity-endangerment code, and USGS topographic quadrangle map name. Details of the rarity-endangerment code are presented in Table II-2. Topographic maps depicting the specific sites of individual plant species have been prepared by the California Native Plant Society and can be compared with site specific project maps.

Under requirements of the Endangered Species Act of 1973, the U. S. Fish and Wildlife Service published (Federal Register, Vol. 41, No. 117, June 16, 1976) a list of 1,700 vascular plants of the United States proposed for protected status as endangered species. Plant species that are included in the proposed federal list and are found in the San Diego area are included in Table II-2.

Table II-2

RARE AND ENDANGERED VASCULAR PLANTS OF THE SAN DIEGO STUDY AREA[1]

Scientific Name / Common Name	REVD Code[2]	USGS Quadrangle[3]	Federal List[4]
Agave shawii / Shaw's agave	2-2-2-1	11B,D	
Ambrosia chenopodiifolia / San Diego bur-sage	1-2-2-1	11D	
A. pumila / San Diego ragweed	2-2-2-2	22C,D; 11A; 21C	
Arctostaphylos glandulosa var. *crassifolia* / Thickleaf manzanita	2-2-2-3	22B	US
A. *otayensis* / Otay manzanita	2-1-1-2	10B,C	
Astragalus deanei / Dean's locoweed	3-2-1-3	21D; 10B	
Brodiaea orcuttii / Orcutt's brodiaea	1-2-2-2	22B,C,D; 10D	US
Calamagrostis densa / Dense reed-grass	2-1-1-3	10D; 21A	
C. dunnii / Dunn's mariposa	3-1-1-3	10D	
Caulanthus stenocarpus / Slender pod caulanthus	2-1-1-3	10A; 21D	
Chorizanthe orcuttiana / Orcutt's chorizanthe	3-2-3-3	11B; 22B	US
C. parryi var. *fernandina* / San Fernando chorizonthe	3-2-2-3	22B	
Cordylanthus orcuttianus / Orcutt's bird's-beak	PE -- 1	10C	
Dichondra occidentalis / Western dichondra	3-3-2-2	10D; 11B; 22B,C	US
Dudleya attenuata ssp. *orcuttii* / Orcutt's dudleya	1-2-1-1	11D	
D. blochmanae ssp. *brevifolia* / Short-leaved dudleya	3-1-1-3	22B,C	
D. variegata / Varigated dudleya	1-2-2-2	10B,C; 11A,D; 21C,D; 22C,D	
Eryngium aristulatum var. *parishii* / San Diego coyote-thistle	2-3-3-2	10C; 22B,C,D	
Erysimum ammophilum / Coast wallflower	1-2-1-3	11B	
Ferocactus viridescens / San Diego barrel cactus	1-3-2-1	10C; 11A,B,D; 22A,B,C	US
Frankenia palmeri / Palmer frankenia (Last reported in 1921)	PE -- 1	11A,D	
Fraxinus trifoliata	3-1-1-1	10A	
Githopsis filicaulis / Mission cayon bluecup (Last reported in 1884)	PE -- 2	22D	US
Hemizonia conjugens / Otay tarweed	3-3-3-3	10B; 11A,C,D	
Lotus nuttallianus / Prostrate hosackia	1-2-2-2	11B,D	
Monardella hypoleuca ssp. *lanata* / Feltleaf monardella	2-1-1-3	10D; 20C; 21D	
Muilla clevelandii / San Diego golden star	1-2-2-2	21B; 22C, D	
Nolina interrata / San Diego molina	2-2-2-3	10A; 21D	US
Ophioglossum californicum / California adder's-tongue fern	2-2-1-2	11B; 21A; 22A,B,C	
Opuntia wigginsii / Wiggins cholla	2-2-2-2	San Diego Co.	
Orcuttia californica var. *californica* / California orcuttia	3-3-3-2	11D	US
Pinus torreyana / Torrey pine	2-1-1-3	22B	
Pogogyne abramsii / San Diego pogogyne	3-3-3-3	22B,C	US
P. nudiuscula / Loma alta pogogyne	3-3-3-2	10C; 22C,D	
Ribes canthariaforme / Moreno current	2-1-1-3	10A; 21A	
Satureja chandleri / San Miguel satureja	1-2-1-2	10B	
Solanum tenuilobatum / Narrow-leaved night shade	2-1-1-3	10D	
Woodsia plummerae / Plummer's woodsia	3-1-1-1	San Diego Co.	

NOTES AND SOURCE can be found on the following page.

Table II-2 (Continued)

NOTES AND SOURCES:

[1] From this california Native Plant Society, 1974, Inventory of Rare and Endangered Vascular Plants of California

[2] REVD Code: Rarity-Endangerment Code

The California Native Plant Society's (1974) Rarity Endangerment Code consists of a series of four numbers used to rate the status of rare or endangered plants. The codes are a series of four digits. The first digit represents rarity; the second, endangerment; the third, vigor; and the fourth, general distribution.

Rarity (R) (..."amount of the plant both in terms of numbers and also in terms of manner and extent of distribution.")
1. Rare, of limited distribution, but distributed widely enough that potential for extinction or extirpation is apparently low at present.
2. Occurrence confined to several populations or one extended population.
3. Occurs in such small numbers that it is seldom reported; or occurs in one or very few highly restricted populations.

PE Possibly extinct or extirpated.

Endangerment (E) (..."embodies the concept of a plant being threatened with extinction or extirpation.")
1. Not endangered.
2. Endangered in part.
3. Totally endangered.

Vigor (V) (..."dynamics of the plant in terms of numbers of individuals or populations.")
1. Stable or increasing.
2. Declining.
3. Approaching extinction or extirpation.

General Distribution (D)
1. Not rare outside California.
2. Rare outside California.
3. Endemic to California

[3] U. S. Geological Survey 7-1/2 minute quadrangles

Coded Number	Quadrangle Name
10A,D	Jumal (15' quadrangle)
*10B	Jumal MTS
*10C	Otay Mesa
*11A	National City
*11B	Pt. Loma
*11D	Imperial Beach
21A	El Cajon Mountains
21B	San Vicente Reservoir

Coded Number	Quadrangle Name
*21C	El Cajon
*21D	Alpine
*22A	Poway
*22B	Del Mar
*22C	La Jolla
*22D	La Mesa

* All or most of the area on this quad sheet is included in the study area.

[4] Indicates those species found on the U. S. Fish and Wildlife proposed list of endangered and threatened plants (Federal Register, Vol. 41 #117, June 16, 1976).

The California Natural Areas Coordinating Council has designated specific locations in the San Diego area as natural areas significant for their scientific or educational interest or representative of California's native biotic communities. These areas (Figure II-9) include:

BORDER FIELD. A 300-acre site (USGS 7-1/2 minute quad, Imperial Beach; 32°31'N, 117°07'15"W) of undeveloped state park land which supports a number of rare plants on a low coastal bluff.

DEHESA NOLINA SITE. A 140-acre site (USGS 7-1/2' quad, Alpine; 32°47'N, 116°51'30"W) that is the type locality for the highly endemic plant, San Diego beargrass (Nolina interrata).

ELLIOTT CHAPARRAL RESERVE. A 107-acre site (USGS 7-1/2 minute quad, Poway; 32°53'15"N, 117°06'W) of chamise chaparral typical of foothills near the San Diego County Coast. Part of the University of California Reserve System.

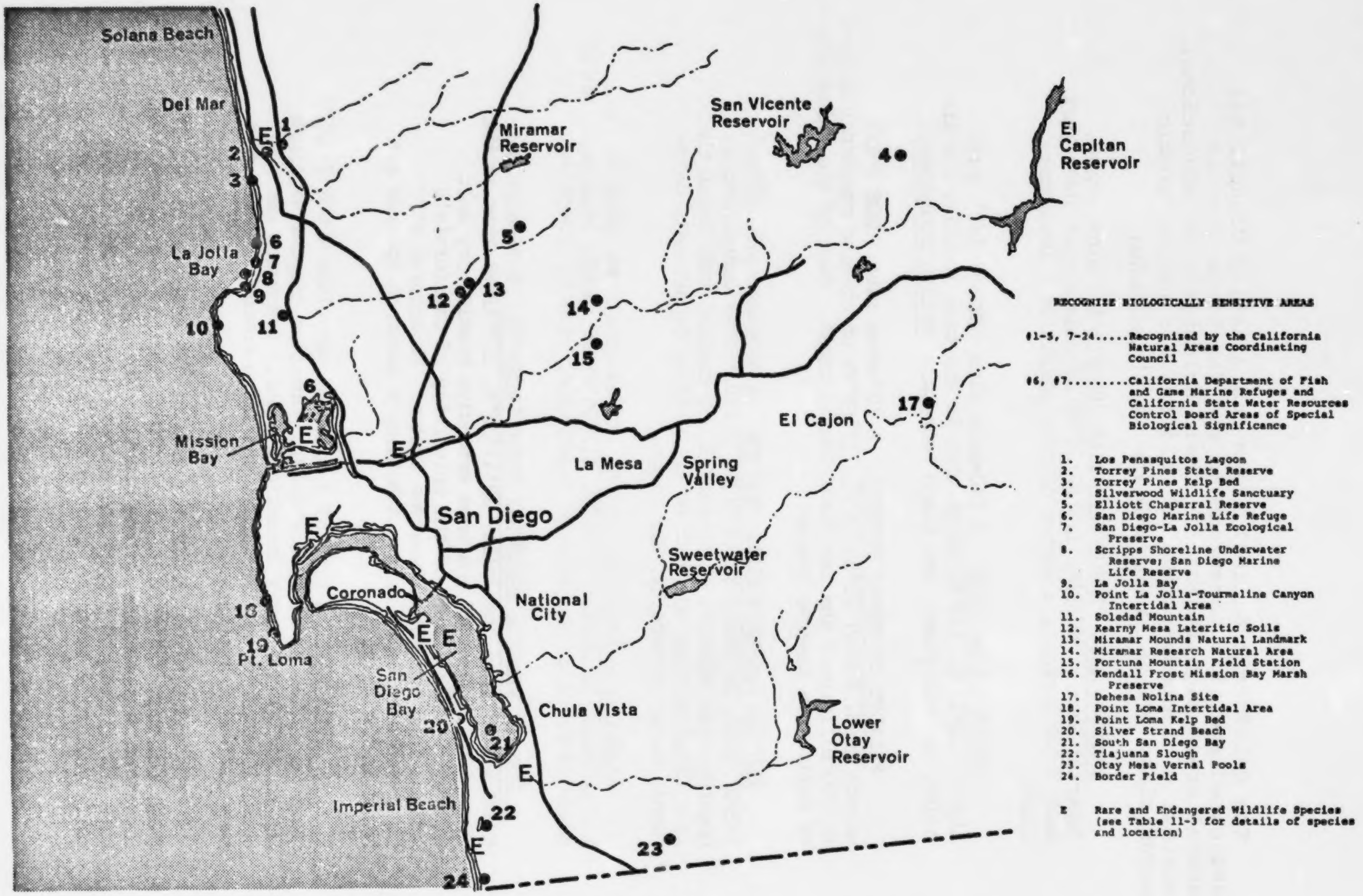
FORTUNA MOUNTAIN FIELD STATION. A 400-acre site (USGS 7-1/2' quad, La Mesa; 32°49'30"N, 117°03'30"W) containing a heterogeneous mixture of chaparral and coastal sage scrub that is a field station operated by the Biology Department, California State University, San Diego.

KEARNY MESA LATERITIC SOILS. A 800-acre site (USGS 7-1/2 minute quad, La Jolla; 32°51'N, 117°08'W) of highly acid soils which supports peculiar and stunted vegetation, rich in endemics.

KENDALL FROST MISSION BAY MARSH PRESERVE. A 96-acre site (USGS 7-1/2' quad, La Jolla; 32°47'35"N, 117°13'W) that is the remaining fragment of the once extensive Mission Bay salt marshes. It is a part of the University of California's Natural Land and Water Reserves System. Endangered birds, light-footed clapper rail and Belding's savannah sparrow are found in the area.

LA JOLLA BAY. A site of 2 miles of shoreline (USGS 7-1/2' quad, La Jolla; 32°51'N, 117°16'W), submarine canyons (Scripps and La Jolla) and rocky intertidal areas. Possesses an unusual number of marine floral and fauna communities due to many different habitats.

LOS PENASQUITOS LAGOON. A site of 385 acres (USGS 7-1/2' quad, Del Mar; 32°55'30"N, 117°14'30"W) that is one of the most important salt marshes in the county. The area is noted for rare and endangered plants and animals (light-footed clapper rail, Belding's savannah sparrow and California least tern).


Solana Beach
Del Mar
La Jolla Bay
Mission Bay
Pt. Loma
Coronado
San Diego Bay
Imperial Beach
Miramar Reservoir
San Diego
La Mesa
National City
Chula Vista
Spring Valley
Sweetwater Reservoir
San Vicente Reservoir
El Cajon
El Capitan Reservoir
Lower Otay Reservoir
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E
RECOGNIZE BIOLOGICALLY SENSITIVE AREAS
#1-5, 7-24.....Recognized by the California Natural Areas Coordinating Council
#6, #7.........California Department of Fish and Game Marine Refuges and California State Water Resources Control Board Areas of Special Biological Significance
1. Los Penasquitos Lagoon
2. Torrey Pines State Reserve
3. Torrey Pines Kelp Bed
4. Silverwood Wildlife Sanctuary
5. Elliott Chaparral Reserve
6. San Diego Marine Life Refuge
7. San Diego-La Jolla Ecological Preserve
8. Scripps Shoreline Underwater Reserve; San Diego Marine Life Reserve
9. La Jolla Bay
10. Point La Jolla-Tourmaline Canyon Intertidal Area
11. Soledad Mountain
12. Kearny Mesa Lateritic Soils
13. Miramar Mounds Natural Landmark
14. Miramar Research Natural Area
15. Fortuna Mountain Field Station
16. Kendall Frost Mission Bay Marsh Preserve
17. Dehesa Nolina Site
18. Point Loma Intertidal Area
19. Point Loma Kelp Bed
20. Silver Strand Beach
21. South San Diego Bay
22. Tiajuana Slough
23. Otay Mesa Vernal Pools
24. Border Field
E Rare and Endangered Wildlife Species (see Table 11-3 for details of species and location)

FIGURE II-9. ECOLOGICALLY SENSITIVE AREAS

MIRAMAR MOUNDS NATURAL LANDMARK. A site of 640 acres (USGS 7-1/2' quad, La Jolla; 32°51'N, 117°08'W) that has legal status as a National landmark. The mounds and associated vernal pools are remnants of once extensive formations that cover, until urbanized, much of the Kearney Mesa.

MIRAMAR RESEARCH NATURAL AREA. (Proposed). A 1,500-acre (USGS 7-1/2 minute quad, La Mesa and Poway; 32°50'30"N, 117° 03'30"W) site of typical examples of coastal sage scrub and southern mixed chaparral.

OTAY MESA VERNAL POOLS. Two sites comprising 300 acres (USGS 7-1/2' quad, Otay Mesa; 32°31'40"N, 116°57'35"W and 32° 35'N, 116°56'20"W) that are noted for their vernal pools that support xeric flora species. Several rare and endangered plant species are found on the sites.

POINT LA JOLLA - TOURNALINE CANYON INTERTIDAL AREA. A site of 3.5 miles of shoreline (USGS 7-1/2' quad, La Jolla; 32°50'N, 117°17'W) that supports a variety of typical southern California rocky intertidal marine communities.

POINT LOMA INTERTIDAL AREA. A site extending the length of the seaward side of the Naval Reservation on Point Loma (USGS 7-1/2 minute quad, Point Loma; 32°41'30"N, 117°15'W) which is an excellent example of southern California rocky intertidal marine life existing in an "almost completely natural state".

POINT LOMA KELP BED. An offshore site (USGS 7-1/2 minute quad, Point Loma; 32°40'N, 117°15'30"W) which supports the largest example of a coastal kelp bed in southern California on a rocky bottom.

SAN DIEGO - LA JOLLA ECOLOGICAL RESERVE. A site of 600 acres (USGS 7-1/2' quad, La Jolla; 32°51'45"N, 117°16'W) fully protected by City of San Diego and noted for its submarine canyon, tidepools and rocky reef.

SILVER STRAND BEACH. A site of 400 acres (USGS 7-1/2' quad, Point Loma and Imperial Beach; 32°37'30"N, 117°08'W) that supports the remains of the dunes and vegetation once known for the area. Of particular significance are the desert species found here in the coastal strand vegetation.

SCRIPPS SHORELINE UNDERWATER RESERVE; SAN DIEGO MARINE LIFE RESERVE. A site of 2,600 feet of shoreline (USGS 7-1/2' quad, La Jolla; 32°51'30"N, 117°16'W) noted for its rocky intertidal area, sandy coast and reefs. The site is part of the University of California Natural Land and Water Reserves System.

SILVERWOOD WILDLIFE SANCTUARY and vicinity. A site of 600 acres (USGS 7-1/2' quads, San Vincente Reservoir, El Cajon Mountain; 32°55'N, 116°52'30"W) that is unique botanically because coastal plant forms meet the mountain forms in this area. A number of rare plant species are supported here.

SOLEDAD MOUNTAIN. A site of 400+ acres (USGS 7-1/2' quad, La Jolla; 32°50'10"N, 117°14'30"W) that supports typical forms of chaparral and coastal sage-scrub plant communities and two species of rare plants.

SOUTH SAN DIEGO BAY. A site of 3,890 acres (USGS 7-1/2' quads, Imperial Beach, National City, Point Loma; 32°37'N, 117°07'W) of salt marsh, mudflats and open water. It is unique among California bays because it is a hypersaline lagoon. The area supports three endangered bird species, the brown pelican, California least tern and the light-footed clapper rail.

TIAJUANA SLOUGH. A 900-acre site (USGS 7-1/2' quad, Imperial Beach; 32°34'N, 117°07'30"W) of coastal salt marsh, sand dunes and coastal scrub. The slough is considered among the best pure marine sloughs in California. Five endangered species have been recorded on the site (California least tern, light-footed clapper rail, California brown pelican, peregrine falcon and Belding's savannah sparrow).

TORREY PINES KELP BED. A site of 1 mile of shoreline (USGS 7-1/2' quad, Del Mar; 32°54'30"N, 117°15'45"W) offshore at the Torrey Pines State Reserve.

TORREY PINES STATE RESERVE. A site of 1,230 acres (USGS 7-1/2' quad, Del Mar; 32°55'N, 117°15'W) that is one of the two remnant sites of the endemic Torrey Pine. The reserve is also the site for a number of other rare plants.

There are a number of species of wildlife that are considered rare, threatened, or endangered (Table II-3). The federal Endangered Species Act of 1973 (PL 93-205) defines "endangered species" to mean "any species which is in danger of extinction throughout all or a significant portion of its range". It defines "threatened species" to mean "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The State of California also has an Endangered Species Act (1970). It uses the classifications "endangered" and "rare". A species which is considered "endangered" is one whose prospect for survival and reproduction is in immediate jeopardy. The animals' peril may result from one or many causes -- loss or change in habitat, overexploitation, predation, competition, or disease.

Table II-3

RARE, ENDANGERED AND THREATENED WILDLIFE SPECIES WHOSE DISTRIBUTIONS INCLUDE THE STUDY AREA

Common Name	Scientific Name	Status*	Comments
American peregrine falcon	Falco peregrinus anatum	E, EN	Breeds in California along the coast
Southern bald eagle	Haliaeetus leucocephalus leucocephalus	E, EN	Occurs statewide
California brown pelican	Pelecanus occidentalis californicus	E, EN	Occurs along California coast from August to November
California least tern	Sterna albifrons browni	E, EN	Occurs along coast from April to September. Crown Point Least Tern Sanctuary was established by City of San Diego in 1974, and a temporary sanctuary is maintained at the south end of Mission Bay. Least Tern Sanctuary established at Naval Training Center, San Diego in 1975.
Light-footed clapper rail	Rallus longirostris levipes	E, EN	Inhabits Los Penasquitos Lagoon, Mission Bay, San Diego River, Sweetwater Marsh, Marine Biological Study Area (Coronado Strand), Otay River Slough and Tijuana River Estuary in small numbers (Wilbur, 1974).
Belding's savannah sparrow	Passerculus sandwichensis beldingi	E	Resident in tidal estuaries of southern California -- pickleweed habitat. Found in study area sites, Tijuana Estuary, Las Penasquitos Lagoon, San Diego Bay, etc.
Blue whale	Balaenoptera musculus	E	Cosmopolitan; occurs along the entire Atlantic and Pacific coast.
Finback whale	B. physalus	E	
Gray whale	Eschrichtius gibbosus	E	
Humpback whale	Megaptera novaeangliae	E	
Right whale	Eubalaena spp.	E	
Sei whale	Balaenoptera borealis	E	
Sperm whale	Physeter catodon	E	

* Status

E	Endangered	designations of the California Department of Fish and Game
R	Rare	
T	Threatened	designations of the U. S. Fish and Wildlife Service
EN	Endangered	

Sources: California Department of Fish and Game, 1976; U. S. Fish and Wildlife Service, 1973 and updates; Wilbur, 1974; and U. S. Department of the Interior, 1976.

Without immediate assistance and protection, an endangered species would probably become extinct. A "rare" species is one that, although not presently threatened with extinction, exists in such small numbers throughout its range that it may become endangered if its numbers are further reduced, its range reduced, or its habitat destroyed.

Marine life refuges are established by the California Fish and Game Commission (Fish and Game Code, Division 7, Article 6). Ecological reserves are maintained through provisions of the Fish and Game Code (Division 2, Sections 1580 through 1584). Two such areas (Figure II-9) are found within the study area.

San Diego-La Jolla Underwater Park — Ecological Reserve	The area enclosed by the prolongation of Avenida de la Playa to a point approximately 1,000 feet seaward of the lowest tideline and a line from that point to Goldfish Point.
San Diego Marine Life Refuge	A strip, approximately 7,000 feet long, north of Avenida de la Playa and extending approximately 6,000 feet seaward of the lowest tideline.

Both these areas have been designated as Areas of Special Biological Significance by the California State Water Resources Control Board (Resolution No. 74-28).

Historical and Archeological Resources

San Diego Bay was discovered in 1542 by Juan Rodriguez Cabrillo and a National Monument dedicated to Cabrillo now stands at Point Loma, near the entrance to San Diego Bay.

European settlement in the San Diego area began in 1769 when, under the command of Gaspar de Portola, a two-pronged expedition -- one a land force from Baja California and the other a sea force from La Paz -- rendezvoused at San Diego. The first of a chain of missions for the conversion of Indians to Christianity was established by Padre Junipero Serra who was a member of the land party. The local Indians, the San Dieguenos, were uncharacteristically independent and resisted the new religion and life (Kroeber, 1953).

The earliest generally recognized Indian culture in the San Diego region was the San Dieguito, dating back 12,000 years. It was followed by the La Jollan, present in the region today. Local archeological sites have gained importance recently because of finds near Del Mar which indicate there may have been human occupancy in the region as long ago as 50,000 years. Cultural remains of prehistoric people are widely scattered in the area. These early residents occupied many of the same areas in the region which are now urbanized and as a consequence many sites were destroyed during the development. About 1,300 sites are recorded in the region. Since only a portion of the region has been surveyed, the number of sites can be expected to increase.

The first recorded mining in the county was during the gold rush in the period 1860 to 1890. Although the local mines yielded only a small fraction of the gold taken from California, they were significant in the history of San Diego County because they provided an incentive to settlers. A branch of the Santa Fe Railroad from Los Angeles was established in 1885. The gold boom created the first significant urbanization in San Diego County.

Historic sites are almost as scattered as prehistoric resources. The best known areas are in Old Town (San Diego), on Point Loma and in National City (Table II-4). The sites reflect the different countries (Spain, Mexico, United States) that have claimed ownership to the area. A number of the historic sites are registered California Historical Landmarks including (Table II-4) the Presidio of San Diego, Old Town Plaza, a number of adobes and ranchos, etc. (Hoover, et al., 1966; and California Department of Parks and Recreation, 1975).

The National Register of Historic Places (required by the Historic Sites Act of 1935 and the Historic Preservation Act of 1966) lists those properties worthy of preservation for their historic value. Approximately 28 sites, (Table II-4), most in metropolitan San Diego area, are recorded on the list (Federal Register, Vol. 42, No. 21, February 1, 1977).

The National Registry of Natural Landmarks is a list of natural areas that are of national significance. The list is prepared by the U. S. National Park Service and the Advisory Board on National Parks, Historic Sites, Buildings and Monuments (of the Secretary of the Interior). Sites within the study area included or proposed for the lists includes: 1) Miramar Mounds and 2) Tia Juana River Estuary (California Geology, 1974).

Table II-4

HISTORIC SITES OF THE SAN DIEGO AREA[1]

Federal and State Registers

Historic Site	California Historical Landmarks (by Registry Number)	National Registry of Historic Places
Chapel of Immaculate Conception	49	
Whaling Station	50	
Spanish Lighthouse (Old Point Loma Lighthouse)	51	x
Mission Dam and Flume	52	x
Casa de Estudillo	53	x
Fort Stockton	54	
Fort Rosecrans National Cemetery	55	
Ballast Point	56	
Punta de los Muertos	57	
San Diego Presidio	59	x
Casa de Lopez	60	
La Playa	61	
Fort Rosecrans	62	
San Diego Plaza	63	
Old Landing	64	
Whaley House	65	
Congress Hall	66	
Serra Palm	67	
Spanish Cemetery	68	
Fort Guijarros	69	
Casa de Pedrorena	70	
Casa de Machado	71	
Cada de Bandini	72	
Casa de Stewart	73	
Casa de Carrillo	74	
Casa de Cota	75	
Mission San Diego	242	x
Derby Dike	244	
La Canada de los Coches Rancho	425	
Exchange Hotel	491	
San Diego Barracks	523	
First School	538	
Montgomery Memorial	711	
Kate O. Sessions Nursery	764	
El Camino Real	784	
San Diego State College	798	
First Military Flying School	818	
Old Town San Diego	830	x
Hotel Del Coronado	844	x
La Jolla Women's Club		x
Red Rest and Red Roost Cottages		x
Brick Row		x
Granger Hall		x
St. Matthew's Episcopal Church		x
California Quadrangle (Panama-California International Exposition)		x
Davis, William Heath, House		x
El Prado Complex		x
Estudillo House		x
Ford Building		x
Initial Point of Boundary between United States and Mexico		x
Klauber, Melville, House		x
Long-Waterman House		x
Marston, George W., House		x
Santa Fe Depot (Union Station)		x
Sorrento Valley Site		x
Spreckels Theatre Building		x
Star of India		x
U. S. Courthouse		x
Villa Montezuma (Jesse Shepard House)		x
Cabrillo National Monument		x

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[1] As listed in the Federal Register, Vol. 42, No. 21 (February 1, 1977) and California Department of Parks and Recreation (1975) California Historical Landmarks.

NOTE: A partial list of city and county historic sites may be found in California Department of Parks and Recreation (1973), The California History Plan, Vol. 2, Inventory of Historical Features (pp. 143-147).

Water Resources

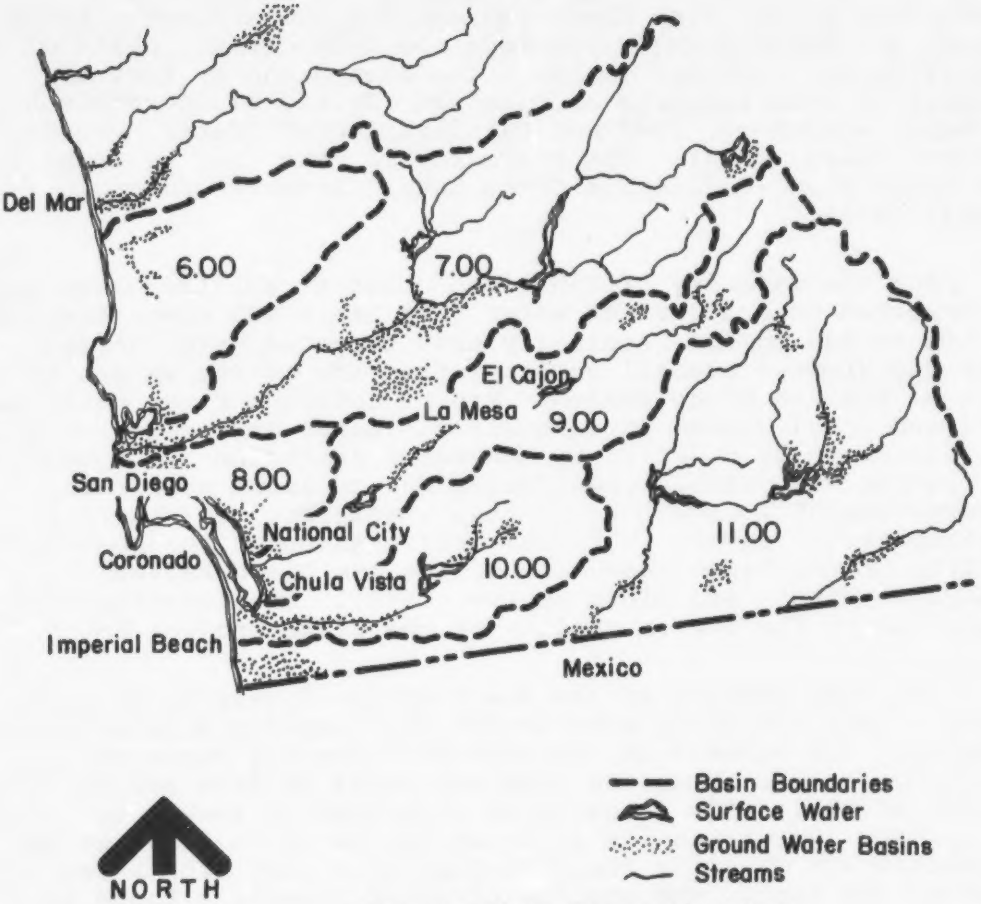
Hydrology

Major streams dissecting the study area include: the San Dieguito River, Penasquitos Creek, San Diego River, Sweetwater River, Otay River and the Tia Juana River. These waters and their tributaries form the hydrographic units of the study area (Figure II-10). The basins can be further subdivided into subunits or subareas (California Department of Water Resources, 1967 and California State Water Resources Control Board, 1975). The hydrographic units may be found in the Basin Plan (California State Water Resources Control Board, 1975).

For the majority of San Diego urban areas, the water supply is imported Colorado River water that has a TDS concentration of 600 to 820 mg/l. Chemically this imported water varies markedly (poorer overall quality) from the native waters of most of the San Diego region. Use of Colorado River water has modified local ground water quality. Local groundwater quality was historically modified by sea water intrusion and upwelling of low quality connate groundwater due to local overdraft. Importation of northern California (State Project Water) is anticipated to result in "local amelioration of the chemical quality of the water resources of the San Diego Region" (SWRCB & RWQCB - San Diego Region, 1975). Amelioration will occur due to the better quality of the State Project Water.

The only portion of the *San Dieguito Hydrographic Unit lying* within the study area is the San Dieguito Hydrographic Subunit. The subunit is rectangular, covering about 45 square miles and extending from the coast to Lake Hodges. Annual precipitation ranges from less than 11 inches to 15 inches. Water-bearing alluvium ranges up to 150 feet in thickness and water is found at depths ranging from a few feet to 100 feet. The quality of water presently found in the alluvium ranges from marginal to inferior, with TDS levels from 1,000 mg/l to greater than 5,000 mg/l common throughout the basin.

Penasquitos Hydrologic Unit is a triangular-shaped area of about 170 square miles, extending from Poway on the east to La Jolla on the west. There are no major streams in this unit although it is drained by numerous creeks. Miramar Reservoir, the major storage facility, contains only imported



5.00	San Diego Hydrographic Subunit
6.00	Penasquitos Hydrographic Subunit
7.00	San Diego Hydrographic Subunit
8.00	Coronado Hydrographic Subunit
9.00	Sweetwater Hydrographic Subunit
10.00	Otay Hydrographic Subunit
11.00	Tia Juana Hydrographic Subunit

FIGURE 11-10. HYDROGRAPHIC BASINS

Colorado River water. Annual precipitation ranges from less than 8 inches along the ocean to 18 inches inland. Excluding the part used by the military, most of the area is utilized for urban purposes.

The area is incised by numerous canyons that are partially filled with alluvial deposits. In the Poway area, residuum has a maximum thickness of approximately 70 feet. The alluvium is about 110 feet thick in some of the coastal canyons.

The character of the water in the coastal area varies. Usually it has a TDS content ranging from 1,500 to 5,000 mg/l. In the Poway area, the TDS content of the groundwater ranges from 750 to 1,500 mg/l. Groundwater in the coastal plain section is generally rated suitable to inferior for domestic purposes, with a high sulfate and TDS content causing the marginal to inferior ratings. The marginal rating of groundwater for domestic purposes in the inland area is generally due to high TDS content.

Groundwater toward the coast is generally rated marginal to inferior for irrigation because of the high chloride ion concentration and a high electrical conductivity. In the area around Poway, groundwater is rated suitable to inferior for irrigation, with the marginal and inferior ratings due to high chloride content.

The San Diego Hydrographic Unit is a wedge-shaped area of about 400 square miles drained by the San Diego River. El Capitan, San Vicente, Cuyamaca, Chet Harritt and Murray Reservoirs are the major storage facilities. San Vicente Reservoir, Murray Reservoir and Chet Harritt Reservoir store mainly local runoff and some Colorado River water, and Cuyamaca stores only local runoff. Land is used largely for urban-residential purposes with agricultural uses being almost non-existent in the metropolitan area. Annual precipitation ranges from less than 11 inches at the coast to about 35 inches around Cuyamaca and El Capitan Reservoirs.

The terrace coastal plain section, consisting largely of the Eocene Poway conglomerate with lesser amounts of alluvium, has been incised by the San Diego River. Alluvium near the mouth of the San Diego River is approximately 100 feet thick, while that near Lakeside attains a thickness of about 200 feet.

TDS content of groundwater in the coastal plain of the San Diego River ranges from 1,000 to 5,000 mg/l. The ratings of groundwater for domestic use in the coastal plain section are generally marginal to inferior because of the high TDS content. Groundwater in the vicinity of El Cajon is rated suitable to inferior for domestic purposes. In the vicinity of Lakeside, groundwater is also rated suitable to inferior for domestic purposes. The marginal and inferior ratings are due mainly to high TDS content and a high sulfide concentration. Ratings of groundwater for irrigation use in the coastal section are generally inferior, while farther inland groundwater is rated suitable to inferior.

Surface water quality above El Capitan Reservoir is considered excellent. Downstream from Santee, the TDS ranges from 146 to 2,779 mg/l and is sustained by rising ground waters and effluent from Santee reclamation project. The lower portion of the San Diego River was designated as a water quality class segment due to eutrophication and discharge of Santee wastewater treatment plant effluent (California State Water Resources Control Board, 1975).

The *Coronado Hydrographic Unit* is an area of about 60 square miles lying between the San Diego River and the Sweetwater watersheds. The heart of the City of San Diego is located within this unit. Nearly all the area is occupied by urban-residential and industrial development. The unit is relatively dry with an annual precipitation of less than 11 to 13 inches. Production of groundwater within the Coronado Hydrographic Unit has been sparse.

The *Sweetwater Hydrographic Unit* is an elongated northeasterly trending strip with an area of about 230 square miles. The major population centers include such communities as Chula Vista, Jamul, Spring Valley and Descanso. Toward the coast, land use is largely urban-suburban residential, while inland it is mainly agricultural. The annual precipitation varies from less than 11 inches at the coast to about 35 inches inland. Runoff is stored in Loveland and Sweetwater Reservoirs.

Pliocene sediments form an important water-bearing formation in the coastal plain section. Groundwater is also available from the alluvium-filled valley of the Sweetwater River in this area. Wells drilled in the alluvium are generally shallow. Alluvium varies from 70 to 100 feet. In the lower reaches of the Sweetwater River, the TDS content of groundwater ranges from 2,000 to 5,000 mg/l. Further inland, between Sweetwater and Loveland Reservoirs, the character of the groundwater varies greatly. TDS ranges from 250 to 1,000 mg/l. In the farthest inland areas, groundwater has a TDS content of less than 500 mg/l.

Groundwater in the coastal plain section of this unit is rated inferior for both domestic and irrigation purposes. Inland, groundwater is generally rated as suitable for both domestic and irrigation purposes, except for a few areas where, because of a high boron or chloride ion concentration, the groundwater is rated marginal for irrigation uses.

The TDS in surface flows sampled has ranged widely, from a low of 185 mg/l to a maximum recorded high of 2,135 mg/l. Spring Valley Creek has demonstrated a mineralization as low as 800 mg/l and as high as 9,700 mg/l TDS.

Otay Hydrographic Unit is a club-shaped area of about 160 square miles. The lower Otay Reservoir is the terminus of the second San Diego aqueduct. Major population centers include the communities of Imperial Beach, San Diego, Chula Vista and Otay in the coastal area and Dulzura inland. Until recently, most of the land was used for irrigated agriculture with urban-residential and commercial uses being secondary. At the present time, urban uses dominate. The annual precipitation generally increases landward from the coast and varies from less than 11 to 19 inches.

The maximum thickness of the alluvium is about 200 feet in the alluvium-filled valley of the Otay River. The San Diego formation is generally more than 1,000 feet thick and has been a major water producer. Production of water in the mountain-valley section has been largely from residuum and the alluvium-filled valleys. Groundwater in the coastal plain section has a TDS content ranging up to more than 2,000 mg/l.

Groundwater in the mountain-valley section of the hydrologic unit has a TDS content of 250 to 500 mg/l with some local areas as high as 1,500 mg/l. In the coastal plain section, groundwater for domestic purposes is rated as suitable to inferior. Groundwater in the mountain-valley section is largely rated as suitable for domestic uses. For irrigation purposes, groundwater in the coastal plain section is rated as marginal to inferior due mainly to a high chloride ion concentration. Surface water quality in Upper Otay Reservoir has ranged from 239 to 836 mg/l TDS, showing an increase with passage of time.

The *Tia Juana Hydrographic Unit* is a long, wedge-shaped area that is drained by Cottonwood and Campo Creeks, tributaries to the Tia Juana River. In California, it covers an area of about 470 square miles and occurs mainly in the mountain-valley section of the hydrographic unit. The unit is sparsely populated. The major population centers are

San Ysidro, Tecate, Potrero, Campo and Pine Valley. With the exception of San Ysidro, none of these centers is a major urban-residential area. The main use of the land is for agricultural purposes. Annual precipitation is less than 11 inches toward the coast, increasing inland to more than 25 inches in the Laguna Mountain area. Runoff is captured by Moreno Reservoir and Barrett Lake on Cottonwood Creek.

The coastal plain section is marked by several terraces in the mesa areas adjacent to the valley of the Tia Juana River. Production of groundwater in the lower Tia Juana River has been from the alluvium, which is more than 100 feet thick. Wells drilled in the alluvium of the Tia Juana River Valley generally range from 30 to 100 feet in depth. In the coastal plain section, the water has TDS contents ranging from 1,000 to more than 5,000 mg/l, with the higher values predominating. A number of wells have had to be abandoned within three miles of the coastline because of seawater intrusion and connate water invasion. Ratings of groundwater for domestic and irrigation uses are largely inferior due to high chloride, sodium and TDS.

Surface water quality in the coastal reach of the Tia Juana River is poor. Outflow from Mexico into California consists primarily of urban runoff which is turbid, high in coliform count, has a tendency to foam and has a significant suspended solids load in the form of trash. From time to time the outflow may carry diluted raw sewage as a result of sewer overflows. Runoff also crosses the border by means of several smaller canyons which pass through urbanized areas in the western part of the City of Tijuana. These outflows also display many of the same water quality characteristics ascribed above to flow in the main river channel. Mineralization of surface water at the international boundary has been as low as 392 mg/l at high flows; low flows generally exceed 2,000 mg/l in TDS.

In the coastal area from San Ysidro to the ocean, TDS ranges from about 800 to 23,000 mg/l, with deterioration being progressive toward the coast. Overextraction and seawater intrusion are the primary factors affecting water quality.

The study area contains a number of coastal groundwater basins that could be susceptible to seawater intrusion. The California Department of Water Resources inventoried the basins and reported their salinity intrusion status. Table II-5 lists the basins and their present status. Readings in excess of 100 ppm for chlorides can be due to seawater intrusion, underlying rock formation, and other factors.

Table II-5

STATUS OF SEA WATER INTRUSION

Basin		1953-55	1970-71
Number	Name		
250	San Dieguito Valley	Chlorides exceed 100 ppm	No change as of 1968
251	Soledad	Chlorides exceed 100 ppm	No change
252	La Jolla	Status unknown	Status unknown
253	Rose Canyon	Chlorides exceed 100 ppm	No change
254	Tecolote Creek	Chlorides exceed 100 ppm	No information
255	San Diego River Valley-Mission	Suspected sea-water intrusion	No change
256	Las Chollas	Chlorides exceed 100 ppm	No change
257	South Las Chollas	Status unknown	Status unknown
258	La Paleta	Status unknown	Status unknown
259	Paradise	Chlorides exceed 100 ppm	No information
260	Sweetwater Valley	Chlorides exceed 100 ppm	No change
261	Otay Valley	Chlorides exceed 100 ppm	No change
262	Tia Juana	Chlorides exceed 100 ppm	No change

Source: California Department of Water Resources, 1975.

Water Supply

The coastal plain in the metropolitan area has been dissected by various rivers which have formed a series of alluvium-filled valleys. In the past, the alluvial valleys provided important groundwater reservoirs. Historically, the groundwater was an important source of supply in the San Diego area as was shown by the large number of wells that were drilled. While demand for groundwater has progressively increased, its availability has decreased and its quality deteriorated in many areas (see previous section). Colorado River water was imported into San Diego County in 1944 and groundwater was relegated to a minor position as a source of domestic water supply for the area (Table II-6).

Approximately ninety-five percent of the water for most of San Diego County's residents is imported by the San Diego County Water Authority from the Colorado River through facilities of the Metropolitan Water District of Southern California. Before the advent of the 1975-1977 drought, the Water Authority had been scheduled to receive northern California water through the State Water Project beginning in about 1977. State Project water, at this tiem is not being supplied to Southern California. Long-term contracts for imported water, however, assure the San Diego County Water Authority of 600,000 acre-feet of annual supply. This is enough to fill tne needs of 2.3 million people at 1972 use rates of 0.26 acre-foot per year per person (San Diego County Water Authority, 1972).

Assuming per capita use rates remain at the 0.26 acre-foot/year/person, the 600,000 acre-feet should assure sufficient water for the Water Authority service area (most of the population of San Diego County) until approximately 1992 or 1993 using San Diego Comprehensive Planning organization Series IV population projections. According to the Comprehensive Plan for the San Diego Region, Water Resources (Comprehensive Planning Organization of the San Diego Region, 1975), the water requirements and sources of supply are adequate in general to meet present and future needs (1995). There is a need to provide treatment capacity for State Project water and to provide additional storage. In general, transmission capacity is adequate for long-range needs, if increased capacity is added in a few jurisdictions. Although supplies are adequate for the long term (providing rainfall patterns return to normal), costs of delivered water will increase due to the increased energy costs of pumping. Recent water rates are listed in Table II-7.

Table II-6

WATER USE AND SUPPLY, 1973-74

Member Agencies	Gross Area	Total Use of Water	Estimated Area Served by Water System	Esti-mated Popu-lation	Water Use/ Capita	SOURCE OF WATER			
						Local Supply		Authority Supply	
	Acres	Acre-Feet	Acres		Acre-Feet/ Capita/Year	Amount Acre-Feet	Percent	Amount Acre-Feet	Percent
Del Mar, City of	1,082	941.6	1,080	4,900	0.19	0	0	941.6	100.0
Helix Water District	31,495	35,466.3	29,200	185,600	0.19	7,607.0	21.4	27,859.3	78.6
National City, City of	5,419	5,116.0	3,900	43,950	0.12	4,546.0	22.6	15,549.0	77.4
Otay MWD	63,895	12,042.7	28,260	33,000	0.36	0	0	12,042.7	100.0
Poway MWD	22,889	7,053.0	9,800	25,300	0.28	0	0	7,053.0	100.0
Rio San Diego MWD	54,213	10,523.5	27,000	70,400	0.15	152.4	1.4	10,371.1	98.6
San Diego, City of	202,704	(1) 153,671.7	106,000	777,300	0.20	8,885.2	5.8	144,786.5	94.2
South Bay Irrigation District	15,571	14,979.0	9,800	86,050	0.17	6,308.5	100.0	0	0

NOTE: Does not include use by City of San Diego for areas outside city (not in Authority).

Source: Lowry & Associates, 1976.

Table II-7

ADOPTED WATER RATES
(Dollars per Acre-Foot)

Southern California Municipal Water District

Fiscal Year		Domestic, Municipal And Industrial Uses			Groundwater Replenishment Uses			Agricultural Uses		
		Untreated	Filtered	Filtered And Softened	Untreated	Filtered	Filtered And Softened	Untreated	Filtered	Filtered And Softened
1973-74	C	56.	63.	68.	30.	37.	42.	25.	32.	37.
	S	66.	73.	-	40.	47.	-	35.	42.	-
1974-75	C	56.	63.	68.	30.	37.	42.	25.	32.	37.
	S	66.	73.	-	40.	47.	-	35.	42.	-
*1974-75	C	56.	63.	63.	30.	37.	37.	25.	32.	32.
	S	56.	63.	-	30.	37.	-	25.	32.	-
1975-76	C	57.	66.	-	31.	40.	-	25.	34.	-
	S	69.	78.	-	43.	52.	-	37.	46.	-

NOTES: C = Colorado River Water S = State Project Water

*Beginning October 1, 1974

Source: Lowry & Associates, 1976.

A recent preliminary draft of a CPO publication, "Water in the San Diego Region 1977", contains information that indicates that the Municipal Water District of Southern California (MWD) may not be able to supply all the water anticipated by its member agencies, one of which is the San Diego Water Authority. MWD allocates its total water production on the basis of assessed valuation within the member agencies boundaries. Two recent events have decreased the water availability to the region served by MWD and thus to the San Diego area: 1) An injunction on Los Angeles limits the amount of water available to it from Owens Valley, and 2) Because of low rainfall in northern California, State Project Water was not available since March 1, 1977. Both of these conditions indicate that there is not a guaranteed amount of imported water available to the San Diego area in the short or long term future. CPO draws the conclusion in the report that there are two highly variable factors affecting water availability in San Diego - the volume of water supply available to MWD and the willingness of residents to finance local distribution systems (CPO, 1977f).

The quality of surface and groundwaters was discussed in an earlier section and more detailed information is available in the Basin Plan (California State Water Resources Control Board and Regional Water Quality Control Board, San Diego Region, 1975). The quality of imported Colorado River water and State Project water (SPW) is given in Table II-8. Imported waters will be blended for delivery beginning with a 50-50 percent blend and reaching 75 percent SPW and 25 percent Colorado River water in the late 1980s (provided normal rainfall conditions prevail in Northern California). Predicted quality of the 50-50 percent blend is given in Table II-9.

Reclamation/recycling offers a potential for reducing the reliance of the San Diego area on imported water. A number of small reclamation projects have been undertaken in the last 25 years in the San Diego area and a number of studies have been conducted. The San Diego Metropolitan Facilities Plan (Lowry & Associates, 1976) reviewed the history of reclamation projects and studies and analyzed the potential for reclamation/recycling in the San Diego area. Possible uses of reclaimed/recycled water include agricultural or landscape irrigation, industry supply or cooling water, potable water supply and other uses. Estimates indicate as much as 100 mgd or 50 percent of the projected 200 mgd could be recycled with appropriate technology. Before any reclamation could be done on a large volume basis, the salinity of the wastewater needs to be significantly reduced. The use of State Project water will improve the domestic water supply and thus the treated wastewater supply that could be reclaimed/recycled. Recycling treated wastewater into the potable water supply

Table II-8

WATER QUALITY DATA: 1973-74 AVERAGES
COLORADO RIVER AND CALIFORNIA AQUEDUCT WATERS

	Colorado River From Lake Mathews	Calif. Aqueduct Jensen Plant
Color (Apparent)	5	1
Turbidity (Units)	0.3	0.2
Temperature °C	18	16
Arsenic	<0.01	<0.01
*Titanium	<0.002	<0.002
Chromium, Hexavalent		
*Chromium, Total	<0.002	<0.002
Barium	0.08	<0.1
*Manganese	0.01	<0.01
Copper	0.03	0.01
*Molybdenum	0.01	<0.01
Selenium	<0.004	<0.004
*Vanadium	0.008	0.006
*Tin	<0.003	<0.003
*Nickel	<0.004	<0.004
*Silver	<0.0006	<0.0006
*Lead	0.001	<0.001
Mercury	<0.0001	<0.0001
*Zinc	0.004	0.02
*Zirconium	<0.004	<0.004
*Lithium	<0.03	<0.03
*Tungsten	<0.03	<0.03
*Antimony	<0.07	<0.07
*Bismuth	<0.002	<0.001
Cadmium	<0.002	<0.001
*Gallium	<0.001	<0.001
Cyanide	<0.002	<0.002
BOD	1.5	1
COD	11	6
Radioactivity		
Gross Beta	6.8	5.4
Gross Alpha	2.9	1.5
Strontium 90	1.4	0.3
Radium 226	0.7	0.02
Pesticides		
Aldrin	<0.05	<0.05
Chlordane	<0.07	<0.07
DDT	<0.3	<0.3
Dieldrin	<0.07	<0.07
Endrin	<0.15	<0.15
Heptachlor	<0.03	<0.03
Heptachlor epoxide	<0.05	<0.05
Lindane	<0.03	<0.03
Methoxychlor	<0.5	<0.5
Toxaphene	<0.3	<0.3

* Spectrographic estimates.
Source: Lowry & Associates, 1976.

Table II-9

PREDICTED QUALITY OF A 50/50 BLEND OF COLORADO RIVER WATER AND STATE PROJECT WATER*

Constituent	Symbol		
Silica	SiO_2	mg/l	8.95
Iron	Fe	"	0.025
Calcium	Ca	"	62
Magnesium	Mg	"	24
Sodium	Na	"	80.5
Potassium	K	"	4
Carbonate	CO_3	"	0
Bicarbonate	HCO_3	"	136
Sulfate	SO_4	"	204.5
Chloride	Cl	"	75.5
Nitrate	NO_3	"	0.8
Boron	B	"	0.14
Fluoride	F	"	0.4
Total Dissolved Solids		"	529
Total Hardness as $CaCO_3$		"	254
Total Alkalinity as $CaCO_3$		"	112
Free Carbon Dioxide		CO_2	1.5
Hydrogen Ion Concentration		pH	8.2
Electrical Conductivity		$ECx10^6$ @ 25°C	858
Color			3
Turbidity		J.T.U.	0.2
Temperature		°F	62
Arsenic		"	0.01
*Titanium		"	0.002
Chromium, Hexavalent			a
*Chromium, Total		"	0.002
Barium		"	0.09
*Manganese		"	0.01
Copper		"	0.02
*Molybdenum		"	0.01
Selenium		"	0.004
*Vanadium		"	0.007
*Tin		"	0.003
*Nickel		"	0.004
*Silver		"	0.0006
*Lead		"	0.001

Constituent	Symbol	
Mercury	"	0.0001
*Zinc	"	0.012
*Zirconium	"	0.004
*Lithium	"	0.03
*Tungsten	"	0.03
*Antimony	"	0.07
*Bismuth	"	0.001
Cadmium	"	0.001
*Gallium	"	0.001
Cyanide	"	0.002
BOD	"	1.25
COD	"	8.5
Radioactivity	PCi/l	
Gross Beta	"	6.1
Gross Alpha	"	2.2
Strontium 90	"	0.85
Radium 226	"	0.36
Pesticides	ppb	
Aldrin	"	0.05
Chlordane	"	0.07
DDT	"	0.3
Dieldrin	"	0.07
Endrin	"	0.15
Heptachlor	"	0.03
Heptachlor epoxide	"	0.05
Lindane	"	0.03
Methoxychlor	"	0.05
Toxaphene	"	0.03

*Spectrographic Estimates

Source: Lowry & Associates, 1976.

will occur only after public health agencies and the public are convinced of the safety of the water.

Floods and Floodplains

The 50-year mean precipitation covering the period 1915-1916 through 1964-1965 was 9.88 inches per year at San Diego. Precipitation increases with elevation proceeding from the coast inland to the mountains in San Diego County. Nearly all stroms that cause floods in the San Diego metropolitan area are winter stroms that move in from the Pacific Ocean. The most notable stroms that occurred during the period of recorded precipitation were those of 1825, 1916, 1921 and 1927. Flooding also was reported to have occurred in the study area in 1884, 1889, 1891, 1895, 1906 and 1937. Thunderstroms of high local intensity occasionally occur at higher elevations in summer but, because of their small areal extent, rarely cause significant flows. Most flows resulting from smaller stroms in the mountainous area are controlled by upstream water impoundment-storage reservoirs. High intensity storms (especially those following other storms) in combination with the steep gradients of the streams and full reservoirs, can result in major flooding. Peak flows in area stream systems resulting from the major stroms since 1916 are listed below.

PEAK FLOWS

Year	Tia Juana[1] River, cfs	Sweetwater[2] River, cfs	San Diego[3] River, cfs	San Dieguito[4] River, cfs
1916	75,000	47,000	70,000	72,100
1927	-	11,200	45,400	-
1937	17,700	33,900	14,200	-
1938	-	11,000	7,350	-
1941	-	-	9,250	-

[1] At Nestor
[2] At Sweetwater Reservoir
[3] Near Santee
[4] At Hodges Dam

The major existing flood control project in the study zone consists of rock-revetted levees on the San Diego River from the mouth to river mile 3.3, just upstream from Morena Boulevard, completed in 1953. Three dams (San Vicente, El Capitan and Cuyamaca) exist on the San Diego River. The Sweetwater River has two dams, Loveland and Sweetwater. The major drainage areas controlled by dams are listed below.

MAJOR DRAINAGE AREAS CONTROLLED BY DAMS

Streams	Total Drainage Area (Sq km)	Number of Dams	Drainage Area Controlled by Dams		Records of Flow, 10^6 cum/y
			Sq km	% of Total	Annual Average
San Dieguito River	850	4	780	92	
San Diego River	1,130	3	700	62	20.7
Sweetwater River	470	2	380	81	
Otay River	390	2	260	67	
Tia Juana River	4,490	4	3,200	71	28.7

Source: Based on California Department of Water Resources, 1969.

A number of flood control studies have been conducted in the area by the U. S. Army Corps of Engineers and other agencies in recent decades. None of the recent studies has resulted in major flood control projects. A strong preference for restricted zoning within 100-year floodplains has developed among local agencies in recent years. Another approach gaining favor is typified by the recently proposed modified flood control project for Mission Valley in the San Diego River. In this case, a reduced-size channel, either concrete or grass-lined earth would be provided and at the same time a floodplain management program undertaken. The approach is considered to offer flood protection with greater aesthetic appeal, and at the same time, greenbelt open-space multiple uses of the flood protection facility. The area of the floodplains (100-year flood zone) within each jurisdiction is given below.

City/ Unincorporated Area	Acres
Carlsbad	1,343
Chula Vista	889
Coronado	0
Del Mar	173
El Cajon	0
Escondido	689
Imperial Beach	833
La Mesa	0
National City	410
Oceanside	4,173
San Diego	7,695
San Marcos	728
Vista	208
Unincorporated	17,946
TOTAL	35,087

Since 1938, when the last major flood occurred in the region, the population has increased more than four-fold. The potential for flooding has little reality for most residents.

An environmental impact report was prepared by the U. S. Army Corp of Engineers (1974, 1976) for the United States Section of the International Boundary and Water Commission on a proposed Tia Juana River flood control project. The project (Figure II-11) will entail a short section of concrete-lined channel just north of the international boarder as a continuation of the channel in Mexico, a leveed energy dissipator, a low flow channel and a leveed sedimentation basin. The sedimentation basin will require the relocating of Dairy Mart Road (as indicated in Figure II-11). Construction is anticipated to begin in January, 1978 and be completed before November, 1978. (R. Cain, pers. comm.).

Air Resources

The air quality of an area is affected by the types and amounts of pollutants emitted into the atmosphere, physical processes (meteorology) affecting the distribution of these pollutants, and chemical reactions involving pollutants and substances naturally present in the atmosphere. Appendix F

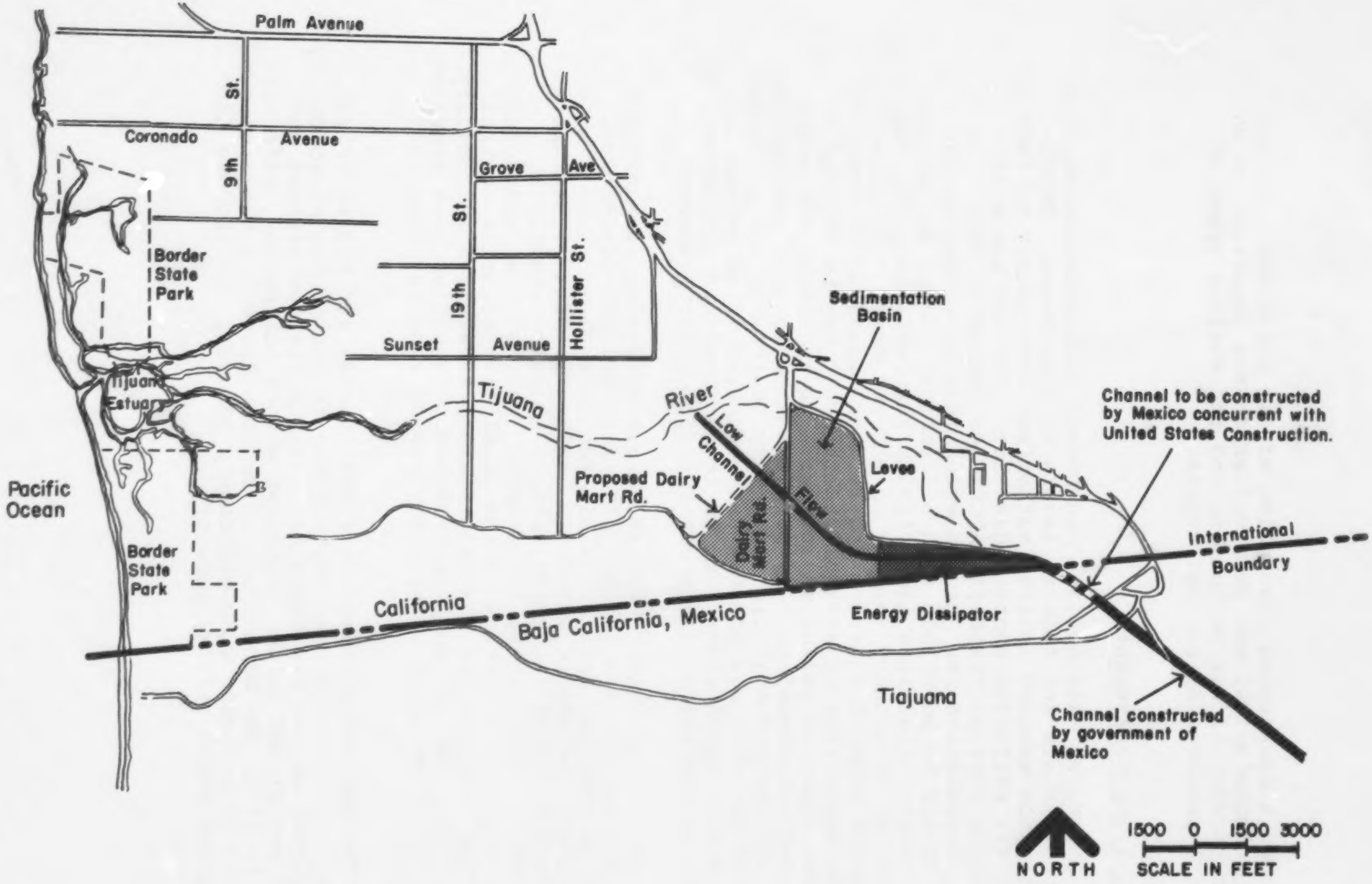


FIGURE II-11. TIJUANA RIVER FLOOD CONTROL PROJECT - LEVEED ENERGY DISSIPATOR

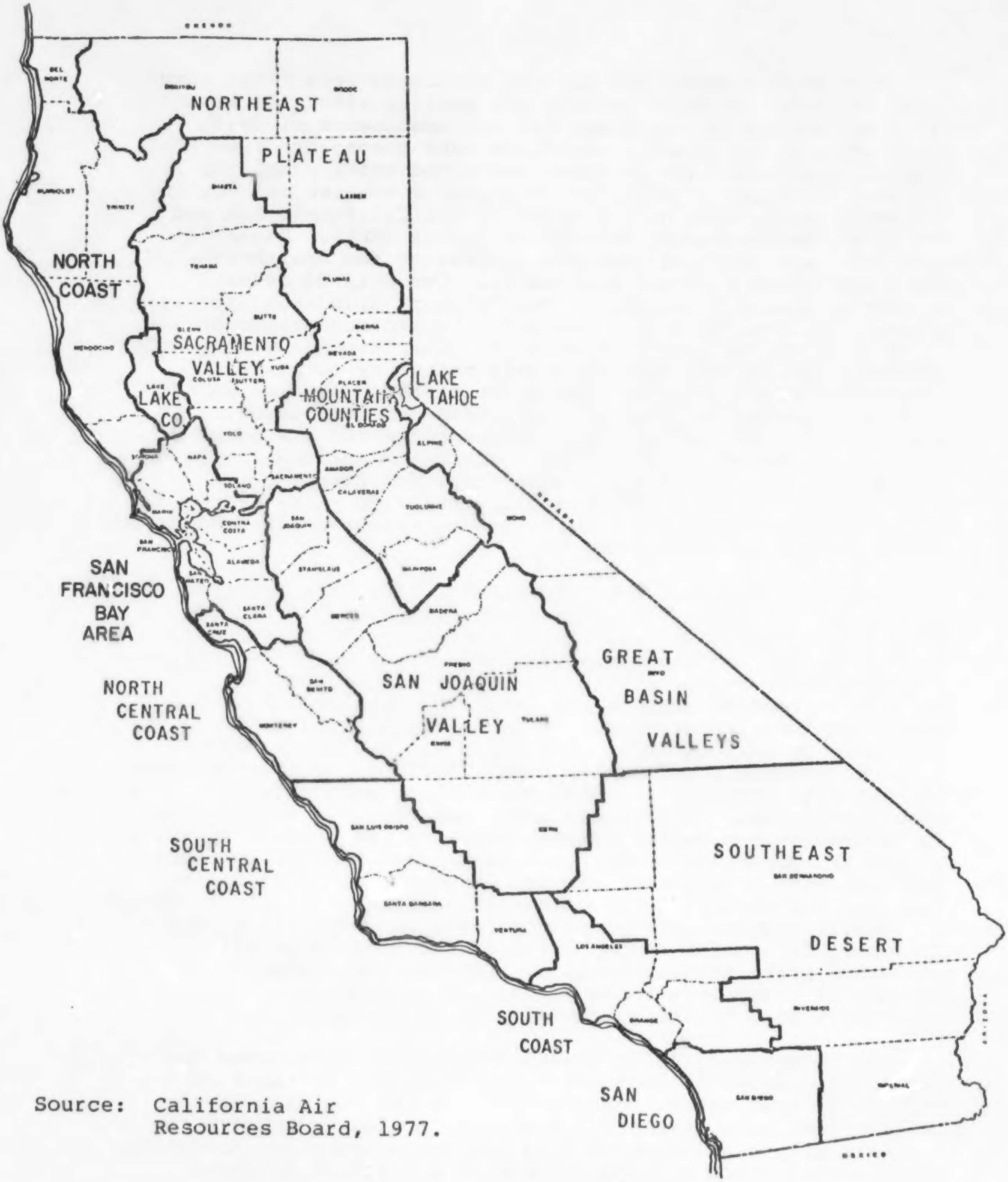
provides a background discussion of air pollution terminology, meteorological and chemical processes important to an understanding of air pollution, and the various types of effects produced by air pollutants.

Air Quality Management

Overview. Air quality management responsibilities exist at local, state and federal levels of government. State legislation enacted in 1947 authorized each county to form a local air pollution control district. The San Diego Air Pollution Control District (APCD) was formed in 1955. In 1970, legislation was enacted which made it mandatory for each county to be within such a district. Local air pollution control districts have primary responsibility for the control of stationary sources of air pollution. Local air pollution control district regulations establish limitations on the quantities of air pollutants which may be emitted by various types of pollution sources. In addition, air pollution control districts have permit authority over the construction and operation of new stationary sources of air pollution. Permits for such new sources can be denied if emissions from that source would either exceed local emissions limitations or result in violation of any ambient air quality standard.

Control of mobile sources of air pollution is exercised at state and federal levels. The 1967 Mulford-Carrel Act, which created the California Air Resources Board (ARB), also authorized the ARB to adopt air quality standards, designate air basins, establish motor vehicle emission standards, monitor air pollutants, and exercise control over stationary sources of air pollution if the local air pollution control district's activities are insufficient to achieve air quality standards. The ARB and its predecessor agencies have required a series of emission control devices on vehicles sold in California.

The ARB has divided the state into 14 air basins (Figure II-12). Originally, the western two-thirds of San Diego County was placed in the San Diego Air Basin while the eastern one-third was placed in the Southeast Desert Air Basin. Effective July 1, 1977, the boundaries of the San Diego Air Basin were revised to coincide with the county boundary (California Air Resources Board, 1977a, page 4).



Source: California Air Resources Board, 1977.

FIGURE II-12. CALIFORNIA AIR BASINS

Statewide ambient air quality standards were first authorized in 1959. Federal ambient air quality standards were first authorized by the Clean Air Act amendments of 1970. State ambient air quality standards take precedence over the federal standards only in cases where the state standards are more stringent. Table II-10 presents ambient air quality standards which have been adopted by the California ARB and the U. S. Environmental Protection Agency (EPA). These standards are based on numerous studies of the health-related and other effects of air pollutants. Two sets of federal standards have been adopted. The "primary standards" identify ambient air quality levels necessary to protect public health "with an adequate margin of safety". The "secondary standards" identify ambient air quality levels necessary to protect "public welfare", such as prevention of air pollution damage to crops, natural vegetation, materials and structures. The adopted state and federal air quality standards are based on available research regarding the effects of various levels of each pollutant. The federal standards, for example, are based largely on data summarized in the Air Quality Criteria documents published by the U. S. Department of Health, Education and Welfare between 1969 and 1971.

The 1970 amendments to the federal Clean Air Act transferred the air pollution control activities of the federal government to the EPA. The Clean Air Act authorized EPA to establish national air quality standards, to establish emission standards for various stationary and mobile sources of pollutants, and to require all states to develop and adopt plans (implementation plans) to achieve and maintain these standards by July of 1975. The Clean Air Act contained provisions allowing EPA to grant time extensions of up to 2 years for the attainment of selected air quality standards in specific regions. Extensions until May 31, 1977 were granted for achieving the federal carbon monoxide and oxidant standards in the San Diego Air Basin. EPA guidelines require that state implementation plans must provide for emission limitations; land use and transportation controls; source monitoring; ambient air quality monitoring; inter-governmental cooperation; and a procedure for review and approval of new sources of air pollution prior to construction. EPA has the authority to approve or disapprove these plans, and to promulgate an acceptable plan if the submitted plan is disapproved.

On December 7, 1972, the California ARB designated the major urban areas of southern California as a critical air area -- an area where, based on 1970 to 1972 oxidant levels, it will take more than a 70 percent reduction to achieve the federal oxidant standard of 0.08 ppm (California Air Resources Board, 1973). The area designated as a Critical Air Area

Table II-10

AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards[1]		National Standards[2]		
		Concentration[3]	Method[4]	Primary[3, 5]	Secondary[3, 6]	Method[7]
Oxidant (Ozone)	1 hour	0.10 ppm (200 ug/m^3)	Ultraviolet Photometry	160 ug/m^3 (0.08 ppm)	Same as Primary Std.	Chemiluminescent Method
Carbon Monoxide	12 hour	10 ppm (11 mg/m^3)	Non-Dispersive Infrared Spectroscopy	—	Same as Primary Standards	Non-Dispersive Infrared Spectroscopy
	8 hour	—		10 mg/m^3 (9 ppm)		
	1 hour	40 ppm (46 mg/m^3)		40 mg/m^3 (35 ppm)		
Nitrogen Dioxide	Annual Average	—	Saltzman Method	100 ug/m^3 (0.05 ppm)	Same as Primary Standards	Proposed: Modified J-H Saltzman (O_3 corr.) Chemiluminescent
	1 hour	0.25 ppm (470 ug/m^3)		—		
Sulfur Dioxide	Annual Average	—	Conductimetric Method	80 ug/m^3 (0.03 ppm)	—	Pararosaniline Method
	24 hour	0.05 ppm* (131 ug/m^3)		365 ug/m^3 (0.14 ppm)	—	
	3 hour	—		—	1300 ug/m^3 (0.5 ppm)	
	1 hour	0.5 ppm (1310 ug/m^3)		—	—	
Suspended Particulate Matter	Annual Geometric Mean	60 ug/m^3	High Volume Sampling	75 ug/m^3	60 ug/m^3	High Volume Sampling
	24 hour	100 ug/m^3		260 ug/m^3	150 ug/m^3	
Sulfates	24 hour	25 ug/m^3	AIHL Method No. 61	—	—	—
Lead	30 Day Average	1.5 ug/m^3	AIHL Method No. 54	—	—	—
Hydrogen Sulfide	1 hour	0.03 ppm (42 ug/m^3)	Cadmium Hydroxide Stractan Method	—	—	—
Hydrocarbons (Corrected for Methane)	3 hour (6-9 a.m.)	—	—	160 ug/m^3 (0.24 ppm)	Same as Primary Standards	Flame Ionization Detection Using Gas Chromatography
Ethylene	8 hour	0.1 ppm	—	—	—	—
	1 hour	0.5 ppm				
Visibility Reducing Particles	1 observation	In sufficient amount to reduce the prevailing visibility to less than 10 miles when the relative humidity is less than 70% (8)		—	—	—
APPLICABLE ONLY IN THE LAKE TAHOE AIR BASIN:						
Carbon Monoxide	8 hour	6 ppm (7 mg/m^3)	NDIR	—	—	—
Visibility Reducing Particles	1 observation	In sufficient amount to reduce the prevailing visibility to less than 30 miles when the relative humidity is less than 70% (8)		—	—	—

Table II-10
(continued)

NOTES:

[1] California standards are values that are not to be equaled or exceeded.

[2] National standards, other than those based on annual averages or annual geometric means, are not to be exceeded more than once per year.

[3] Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of Hg (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4] Any equivalent procedure which can be shown to the satisfaction of the Air Resources Board to give equivalent results at or near the level of the air quality standard may be used.

[5] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health. Each state must attain the primary standards no later than three years after that state's implementation plan is approved by the Environmental Protection Agency (EPA).

[6] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after implementation plan is approved by the EPA.

[7] Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

[8] Prevailing visibility is defined as the greatest visibility which is attained or surpassed around at least half of the horizon circle, but not necessarily in continuous sectors.

* Applies only on days when the California 1-hour oxidant standard or the California 24-hour suspended particulate standard is violated.

generally includes those portions of Santa Barbara, Ventura, Los Angeles, southwestern San Bernardino, western Riverside, Orange and San Diego Counties below 3,000 feet in elevation.

Revision 5 to the California Implementation Plan (California Air Resources Board, 1974b) identified the San Diego Air Basin as an air quality maintenance area with respect to particulate matter, oxidants, and carbon monoxide. Air quality maintenance areas are those areas which either (a) currently exceed one or more national air quality standards and are not expected to achieve the national standard by 1980; or (b) currently meet all national air quality standards but are expected to exceed one or more standards by 1985. Such a designation requires the development of an air quality maintenance plan to assure the earliest feasible achievement and subsequent maintenance of the air quality standards of concern.

In mid-1974, San Diego County formed an Air Quality Planning Team composed of staff representatives from San Diego County, the Comprehensive Planning Organization, the City of San Diego, the county Air Pollution Control District, and Caltrans District 11. The planning team was assisted by a Policy Advisory Committee and a Technical Resource Panel. The Air Quality Planning Team published several reports, with the major document being the April 1976 *Regional Air Quality Strategies For San Diego County* [normally referred to as the "RAQS" report]. The California ARB began coordinating the development of air quality maintenance plan (AQMP) efforts in mid-1975. Following the completion of the Air Quality Planning Team's activities, CPO and the county APCD assumed responsibility for the AQMP program in San Diego County.

In September 1976, ARB released a report outlining a proposal to establish an Air Conservation Program in California (California Air Resources Board, 1976f). This program is designed to meet EPA "no significant deterioration" regulations for existing "clean air areas" as well as state legislative mandates to protect and enhance air quality throughout the state. The program as outlined in preliminary form would classify all areas of the state into one of four categories: areas in which no deterioration of existing air quality levels would be allowed; areas where a certain amount of deterioration from existing air quality levels would be allowed, but which would maintain air quality superior to existing health-related standards; areas in which air quality standards to protect agricultural productivity would be met; and areas where existing health-related standards are adequate as air quality goals. The details of such an air conservation program are expected to be developed during the next two years.

Air Quality Maintenance Planning. As mentioned above, the AQMP program in San Diego County has continued the work initiated by the county Air Quality Planning Team. The efforts of that group culminated in the April 1976 Regional Air Quality Strategies for San Diego County. This "RAQS" report outlined a series of alternative programs for achieving and maintaining ambient air quality standards in the air basin. These are summarized in Table II-11. Strategies A and B are based on the assumption that pollutants emitted within the air basin are capable of producing oxidant levels of up to 0.20 ppm (parts per million), with all recorded oxidant values above this level being due to pollutant transport from the South Coast Air Basin (Los Angeles, Orange, Riverside and San Bernardino Counties). Strategy C was based on the assumption that pollutants emitted within the San Diego Air Basin are capable of producing oxidant levels up to 0.28 ppm (the highest value monitored in 1972).

As indicated by Table II-11, the burden for implementing many of the oxidant reduction strategies falls primarily on the California ARB and the county APCD, with 93-96 percent of the projected emissions reductions being a result of tactics implemented by these agencies. The RAQS report estimates that EPA, Caltrans, local transit agencies, local governments, and other agencies would each be responsible for achieving 1-2 percent of the projected emissions reductions under any of these strategies. On June 21, 1976, the Comprehensive Planning Organization adopted Strategy B plus tactics P7 and T1 (modified) as the basis for the air quality maintenance plan in the San Diego Air Basin. CPO also adopted an "air management process" for implementing the adopted tactics and ensuring that local agencies consider the air quality implications of projects they undertake or approve. On August 25, 1976 the County Board of Supervisors, sitting as the APCD Board of Directors, adopted Strategy B plus Tactics P7 and T1 (modified), but not the proposed air management process. In December 1976, both CPO and the APCD adopted a revised air management process. The adopted RAQS tactics and air management process are presented in Appendix B. The City of San Diego, however, has not adopted "Attachment 4" of the material presented in Appendix B (Joe Flynn, City of San Diego, pers. comm.). Throughout the remainder of this EIS, "Attachment 4" has been designated as Tactic T1 (modified). EPA has not accepted the above programs as being an adequate air quality maintenance plan. Work on the AQMP program for the San Diego Air Basin is continuing.

Existing Air Quality Conditions

Air Pollution Trends. Yearly variations in monitored ambient air quality reflect not only changes in the quantities of air pollutants emitted into the atmosphere, but

Table II-11

SUMMARY OF RAQS TACTICS AND STRATEGIES

Tactics			Primary Implementation Responsibility							Component of Strategy		
Designation	Emission Source Category	Description	EPA	ARB	APCD	Cal-trans	Transit Agencies	Local Government	Other	A	B	C
A1	Aircraft	Tow commercial jets from terminal gates to head of runway for takeoff.	x						x			
A2	Aircraft	General aviation aircraft evaporative controls on new models in 1980.	x							x	x	x
C1	Combustion	Energy conservation measures with incentives to use non-polluting sources of energy and reduce RHC emissions from combustion sources.		x	x							
P1	Process losses	Dry cleaners to implement product change/ controls on equipment to give 50% RHC reduction by 1980.			x					x	x	x
P2	Process losses	Surface cleaning products RHC emissions reduced 50% by product change, alternate process or capture of vapors.			x					x	x	x
P3	Process losses	Architectural surface coatings (paints) shift to non-reactive bases and/or control of exhaust vapors. RHC reduction targets: 1980 = 25%, 1985 = 60%, 1990-2000 = 90%.			x					x	x	x
P4	Process losses	Industrial surface coatings (paints) shift to non-reactive bases and/or control of exhaust vapors. RHC reduction targets: 1980 = 30%, 1985 = 60%, 1990-2000 = 90%.			x					x	x	x
P5	Process losses	Architectural surface coatings (paints). Same tactic as P3 except that 90% reduction target advanced to 1985.			x							x
P6	Process losses	Industrial surface coatings (paints). Same tactic as P4 except 90% reduction target advanced to 1985.			x							x

Tactics			Primary Implementation Responsibility							Component of Strategy		
Designation	Emission Source Category	Description	EPA	ARB	APCD	Cal-trans	Transit Agencies	Local Government	Other	A	B	C
P7	Process losses	Vapor recovery equipment effectiveness improved to 95% by 1985. Extends control rules to cover certain exempt facilities			x					x		x
P8	Process losses	Vapor recovery equipment effectiveness improved to 95% by 1980. Same tactics as P7 except that 95% effectiveness requirement advanced 5 years.			x							x
P9	Process losses	Gasoline volatility reduction during summer months from FEVI 12 to FEVI 10. If implemented there is less RHC reduction from evaporative control tactics.		x						x	x	x
M1	Motor vehicles	Inspection and maintenance of on-road motor vehicles to give 7% reduction in RHC emissions below nominal levels for pre-1975 model light-duty vehicles and all heavy-duty vehicles, motorcycles and Mexican registered vehicles.		x						x	x	x
M2	Motor vehicles	Inspection and maintenance of off-road motor vehicles to give 7% reduction in RHC emissions below nominal levels.		x								x
M3	Motor vehicles	California light-duty vehicle emission standards and adopted 6 gm evaporative standard for post 1977 model years.		x						x	x	x
M4	Motor vehicles	California 5/25 exhaust emission standard and evaporative standard for heavy-duty vehicles for post-1977 model years.		x						x	x	x
M5	Motor vehicles	California Street motorcycle emission standards three-phase reduction regulations of 10 gm/km HC in 1978, 5 gm/km in 1980, and 1 gm/km in 1982 and after.		x						x	x	x

Tactics			Primary Implementation Responsibility							Component of Strategy		
Designation	Emission Source Category	Description	EPA	ARB	APCD	Cal-trans	Transit Agencies	Local Government	Other	A	B	C
M6	Motor vehicles	100,000-mile emission warranty for light-duty passenger vehicles beginning with 1980 models.		x								x
M7	Motor vehicles	Additional evaporative controls on light-duty vehicles meeting a 2 gm HC standard beginning with 1980 model year.		x						x	x	x
M8	Motor vehicles	Retrofit evaporative controls on 1970-77 light-duty vehicles meeting a 12 gm HC standard.		x								x
M9	Motor vehicles	Additional evaporative emission controls on light-duty vehicles meeting a 1 gm HC standard beginning with 1982 model year.		x						x	x	x
M10	Motor vehicles	100,000-mile emission warranty for light-duty trucks beginning with 1980 model year.		x								x
M11	Motor vehicles	Retrofit exhaust oxidation catalysts on 1970-77 heavy-duty gasoline-powered vehicles. Assume 60% reduction in RHC emissions.		x								x
M12	Motor vehicles	Retrofit evaporative controls on 1970-77 gasoline-powered heavy-duty vehicles meeting a standard of 12 gm per "hot soak" phase.		x								x
M13	Motor vehicles	Emission standards for off-road recreation vehicles same as equivalent on-road vehicles, beginning in 1978.		x								
M14	Motor vehicles	Emission standards for off-road heavy-duty vehicles same as 5/25 standard for on-road class beginning with 1980 models.		x							x	x
M15	Motor vehicles	Emission standards for farm equipment meet 5/25 certification beginning in 1980.		x								

Tactics			Primary Implementation Responsibility							Component of Strategy		
Designation	Emission Source Category	Description	EPA	ARB	APCD	Cal-trans	Transit Agencies	Local Government	Other	A	B	C
T1* (modified)	Motor vehicles	Reconcile differences between Regional Comprehensive Plan, Regional Transportation Plan and local General Plans.				x	x	x		x		x
T2	Motor vehicles	Maximum carpools/vanpools plus incentives. Assume implementation by 1980 and 7% VMT and 5% trip reduction for light-duty vehicles.				x					x	x
T3	Motor vehicles	Communication substitutes and home goods delivery to reduce need for personal travel. VMT and trip reduction targets for light-duty vehicles: 1980 = 2%, 2000 = 10%.							x	x	x	x
T4	Motor vehicles	Gasoline rationing for light-duty vehicles from 1977 to 1990 with 15% curtailment of gasoline consumption for non-commercial vehicles.							x			
T5	Motor vehicles	Maximum bus service improvements: existing trends bus alternative.					x	x				
T6	Motor vehicles	Demand responsive transit system. Dial-A-Ride on a scale (900 vans) to reduce light-duty vehicle trips in 1985 by 1%.					x	x				
T7	Motor vehicles	Maximum bicycle system in addition to that included in tactic T1. Includes adopted regional system, local networks, employer incentives, bike-and-ride, and storage facilities.						x		x	x	x
T8	Motor vehicles	Inter-urban transportation alternatives with improved bus, air and rail transit, terminal expansion and upgrade equipment.					x	x	x			

Tactics			Primary Implementation Responsibility							Component of Strategy		
Designation	Emission Source Category	Description	EPA	ARB	APCD	Cal-trans	Transit Agencies	Local Government	Other	A	B	C
T9	Motor vehicles	Balanced communities - land use/transportation patterns. Motor vehicle travel minimized by balancing land use, population and employment within each community.						x				
T10	Motor vehicles	Maximum urban transit with concentrated development oriented according to transit availability.					x	x				
T11	Motor vehicles	Tax on second and third car ownership.							x			
T12	Motor vehicles	Transit fare reduction to zero on public bus system.					x	x				
T13	Motor vehicles	Commercial goods transported via less polluting vehicles to shift 20% of gasoline truck VMT to diesel; 10% to other modes.							x			
T14	Motor vehicles	Traffic flow improvements to minimize congestion on non-freeway streets and increase average speed 10%.				x		x				x
T15	Motor vehicles	Gasoline tax at pump. Goal is 15% reduction of gasoline consumption by non-commercial light-duty vehicles (same as tactic T4). Tactic ends in 1990.							x			
X1	Railroads	Rail engine controls as proposed by EPA.	x									
X2	Home utility	Home utility engines RHC emissions reduced by controls and/or shift to low polluting power sources with 50% reduction from new equipment by 1980.		x							x	x

NOTES: EPA = U. S. Environmental Protection Agency
ARB = California Air Resources Board
APCD = San Diego Air Pollution Control District

* Tactic T1 was originally defined as implementation of the Regional Comprehensive Plan and Regional Transportation Plan.

Sources: San Diego Air Quality Planning Team, 1976a; Comprehensive Planning Organization, 1976a.

also differences in weather conditions and patterns. Because weather factors play a dominant role in determining pollution levels during any given year, air quality trends can only be determined from several years of data.

The major air quality problem in the San Diego Air Basin centers on photochemical oxidants. Table II-12 summarizes data on the frequency with which the federal oxidant standard has been violated in the San Diego Air Basin. Maximum 1-hour oxidant levels for each station are also shown. Data for 1973 through 1975 have been corrected by the California ARB to reflect the June 1975 change in monitoring instrument calibration procedures. Figure II-13 illustrates the geographic distribution of 1976 oxidant levels.

The federal 1-hour carbon monoxide standard (35 ppm) has not been exceeded at any of the existing monitoring stations. The former monitoring station at 8th and E Streets in San Diego occasionally reported values equalling or exceeding the federal standard (i.e., in 1963, 1965, 1968, and 1972). The federal 8-hour moving average carbon monoxide standard (9 ppm) is occasionally exceeded at several monitoring stations. Data published by the county APCD and the state ARB exhibit significant discrepancies regarding the frequency of such violations of this standard.

The state 1-hour nitrogen dioxide standard (0.25 ppm) is typically violated a few days each year at various stations. The federal annual average NO_2 standard (0.05 ppm) was exceeded at the El Cajon and downtown San Diego stations in 1976.

Suspended particulate levels frequently exceed the state 24-hour standard (100 $\mu g/m^3$), and occasionally exceed the federal primary and secondary 24-hour standards (260 $\mu g/m^3$ and 150 $\mu g/m^3$, respectively). The federal and state annual standards for particulates (75 $\mu g/m^3$ and 60 $\mu g/m^3$, as annual geometric means) are also exceeded at various monitoring stations. State standards for lead and sulfate aerosols have been exceeded at some stations.

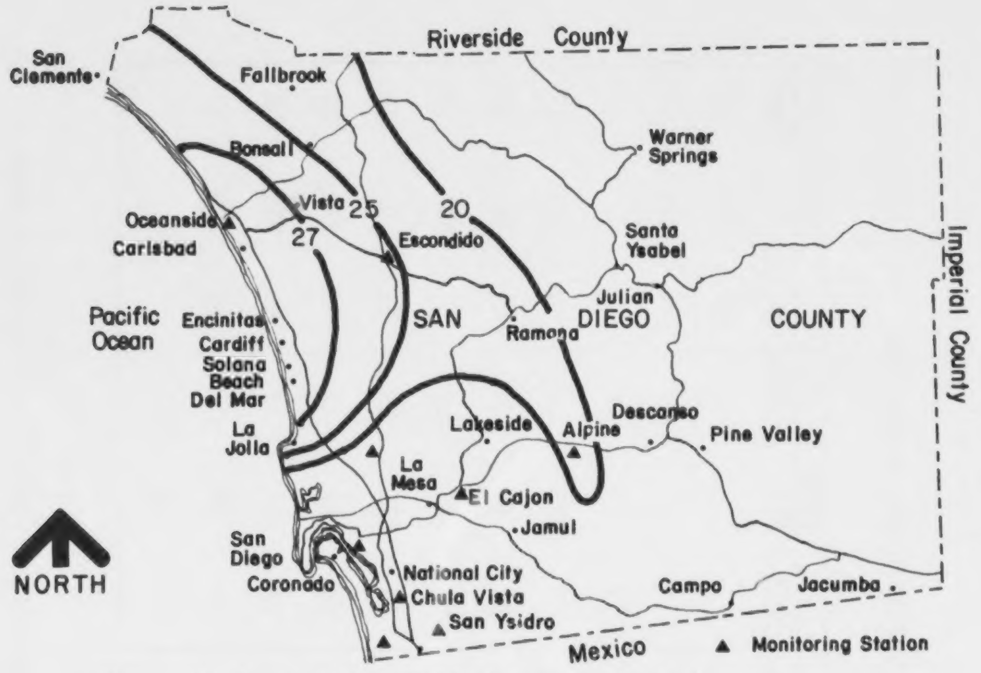
The federal standard for nonmethane hydrocarbons (0.24 ppm, as a 3-hour, 6:00 to 9:00 a.m. average) are exceeded on most days of the year at one or more monitoring stations in the air basin. The state and federal sulfur dioxide standards have not been violated at any of the monitoring stations in the air basin.

Table II-12

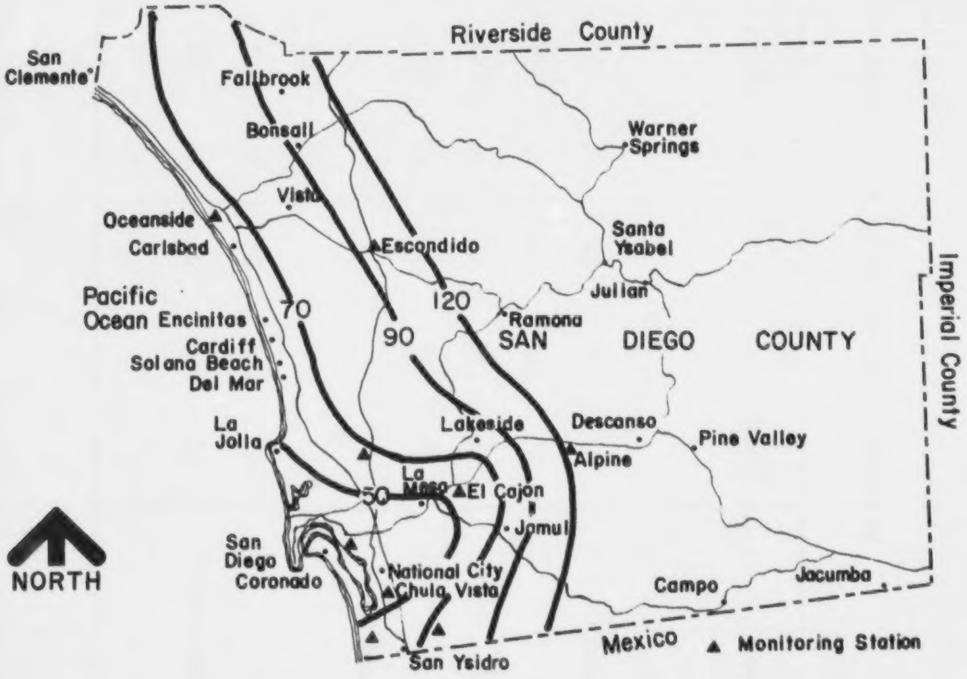
OCCURRENCES OF OXIDANT LEVELS EXCEEDING FEDERAL STANDARDS

	1973			1974			1975			1976		
Station	Days	Hrs.	Peak	Days	Hrs.	Peak	Days	Hrs.	Peak	Days	Hrs.	Peak
Alpine										123	554	22
Brown Field										73	296	19
Chollas Heights	61	256	24	24	57	16	17	36	14			
Chula Vista	51	186	24	38	109	16	40	123	19	48	129	17
El Cajon	53	159	21	56	180	17	32	80	14	60	181	16
Escondido	45	183	27	81	299	23	53	181	28	97	386	25
Imperial Beach							39	139	19	21	93	16
Kearny Mesa				42	161	23	54	192	22	79	310	19
Oceanside	49	265	21	31	83	28	43	161	19	69	259	29
San Diego-Downtown	33	97	21	23	58	15	23	66	15	45	132	17
San Ysidro				17	53	23	10	19	11			

Sources: California Air Resources Board, 1976c, 1976d, 1977d; San Diego County Air Pollution Control District, 1977c.



1976 Maximum 1-Hour Oxidant Levels (pphm)



1976 Days Over Federal Oxidant Standard (8 pphm)

FIGURE II-13. DISTRIBUTION OF OXIDANT LEVELS DURING 1976

Source: San Diego County Air Pollution Control District, 1977.

Pollutant Transport Patterns. Periodic high oxidant levels recorded at Oceanside and Escondido have prompted the APCD to investigate the possibility of pollutant transport into the San Diego Air Basin from the South Coast Air Basin. Sklarew, et al. (1975) evaluated all days during the January 1974 to January 1975 period on which one or more monitoring stations in the San Diego Air Basin reported a peak oxidant level of 0.17 ppm or greater (corrected for recent instrument calibration changes). The major focus of this study involved constructing surface wind trajectories to identify the source area for air parcels with high oxidant levels. Regional weather maps and data on winds aloft; inversion height, depth, and strength; and temperature levels at various monitoring stations were also used to evaluate each of the 12 pollution episodes (17 days) analyzed.

This study concluded that for the 13-month period analyzed, pollutant transport from the Los Angeles Basin accounted for all instances when oxidant levels in the San Diego Air Basin exceeded 0.17 ppm. Transport by surface winds over the ocean accounted for most instances, with transport aloft and subsequent fumigation to ground level accounting for a few cases of high oxidant levels. The study also concluded that the highest oxidant level produced solely by locally generated emissions in 1974 was 0.16 ppm.

In most cases, the analyses presented by Sklarew, et al. (1975) are well supported by the combination of trajectory analyses, data on inversion layer characteristics, and local temperature data. Days characterized as indicating fumigation from pollutants transported overland as elevated strata are somewhat less well supported due to the lack of inland upper air wind monitoring. One day characterized as illustrating interbasin, surface transport over the ocean may be open to other interpretations. The ozone monitoring instrument at Oceanside was not functioning during this period, resulting in an absence of data from a key monitoring station. The trajectory analysis for this pollution episode indicates a 31-hour transport period from the Los Angeles basin to San Diego County. The lack of data from Oceanside and the long transport period weaken, but do not disprove, the conclusion that the 0.23 ppm oxidant level at Kearny Mesa was due to transport from the South Coast Air Basin. Analyses for two of the days studied were characterized as "ambiguous", with insufficient data to clearly demonstrate pollutant transport. On one of these days, two stations in the air basin reached oxidant levels of 0.23 ppm.

In summary, the study by Sklarew, et al. presents data indicating that pollutant transport from the South Coast Air Basin is a rational explanation for most high oxidant levels experienced during the 13-month study period. But that study does not prove that such transport is the only rational explanation for each and every pollution episode studied. Sklarew, et al. clearly demonstrate the occurrence of occasional pollutant transport from the South Coast Air Basin. But a single 13-month period is insufficient to determine a maximum oxidant level produced solely by locally generated pollutant emissions, since similar peak oxidant levels have been reported in other years.

A more detailed study of pollutant transport from the South Coast Air Basin has recently been completed. Data from this study are still being analyzed. No preliminary results are yet available.

Pollutant transport from the Tijuana area of Baja California is suggested by pollution levels monitored at San Ysidro and other stations in the southern part of the county. This issue has received little study. Particulates are the major pollutant of concern, but transport of oxidants or oxidant precursors may also be significant at times.

Marine Environment

Marine Geology

The coastline and bathymetry features are major marine landforms in the study area. The sea must flow over or around them; they help shape current patterns. The bottom sediments receive all settleable materials washed from the land and discharged through the outfall, and also those substances which are converted to settleable forms by organic, chemical or physical action. Sediment characteristics have a dominant influence on the types of organisms that inhabit the area.

The Point Loma discharges have not significantly changed marine landforms. However, bottom sediments have been altered; those changes are described in a subsequent section.

Coastline. The coastline in the study area contains three major landforms. From Del Mar to the La Jolla headlands a long sandy beach has been eroded from the cliffs behind it. It is interrupted only by river mouths and their associated lagoons. The sandstone headlands of Point

La Jolla and Point Loma to the south have resisted erosion; their shores are rocky and irregular. They flank a beach formed of softer sediments and alluvial deposits of the San Diego River. South of Point Loma a long, smoothly curving strand encloses San Diego Bay. It has been deposited by the longshore drift due to wave refraction around Point Loma. The beach continues south to the Mexican border, broken only by the mouth of the Tia Juana River (Lowry & Associates, 1976; U. S. Geological Survey, 1970; U. S. Soil Conservation Service, 1973).

Peeling (1974) reported on the shoreline south of Point Loma:

"Southern California, for the most part, exhibits a littoral transport of beach sands in a southerly direction. But, because of an eddying of the coastal current created by the shoreline of Point Loma, the net transport of sand in the Imperial Beach and Silver Strand area is northward. Historically, the sand transported in this way was replaced by sand that moved north after entering the ocean from the Tia Juana River. Since the damming of the river in 1937, however, this replacement sand has not been available, and the northern beaches have undergone severe erosion. Even though 28,300,000 cubic yards of dredge spoils have been placed on the beaches since 1940, studies indicate that from 1.4 to 2.1 million cubic yards are being moved annually by current and wave action into offshore waters and are permanently lost to the littoral system (Inmann, 1973)." "Figure II-14 illustrates this littoral movement and the accretion of sand in offshore areas."

Nordstrom and Inmann (1973) have discussed in greater detail the phenomenon of beach and cliff erosion in San Diego County.

Bathymetry. The sea off this coast lies within the southern California bight, a large complex region of submarine basins and troughs, that is partially enclosed by a broad coastal indentation between Point Conception and Cabo Colnett, Baja California. The bight extends westward to the California current, 90-300 km from the coast.

The bight is a narrow continental shelf extending to about 75-140 meters in depth. Within the study area, it is divided into two regions (Stevenson, 1961). The Oceanside Narrow Shelf complex extends north from Point Loma to Huntington Beach and averages only three miles in width. South of Point Loma, the San Diego Shelf complex averages

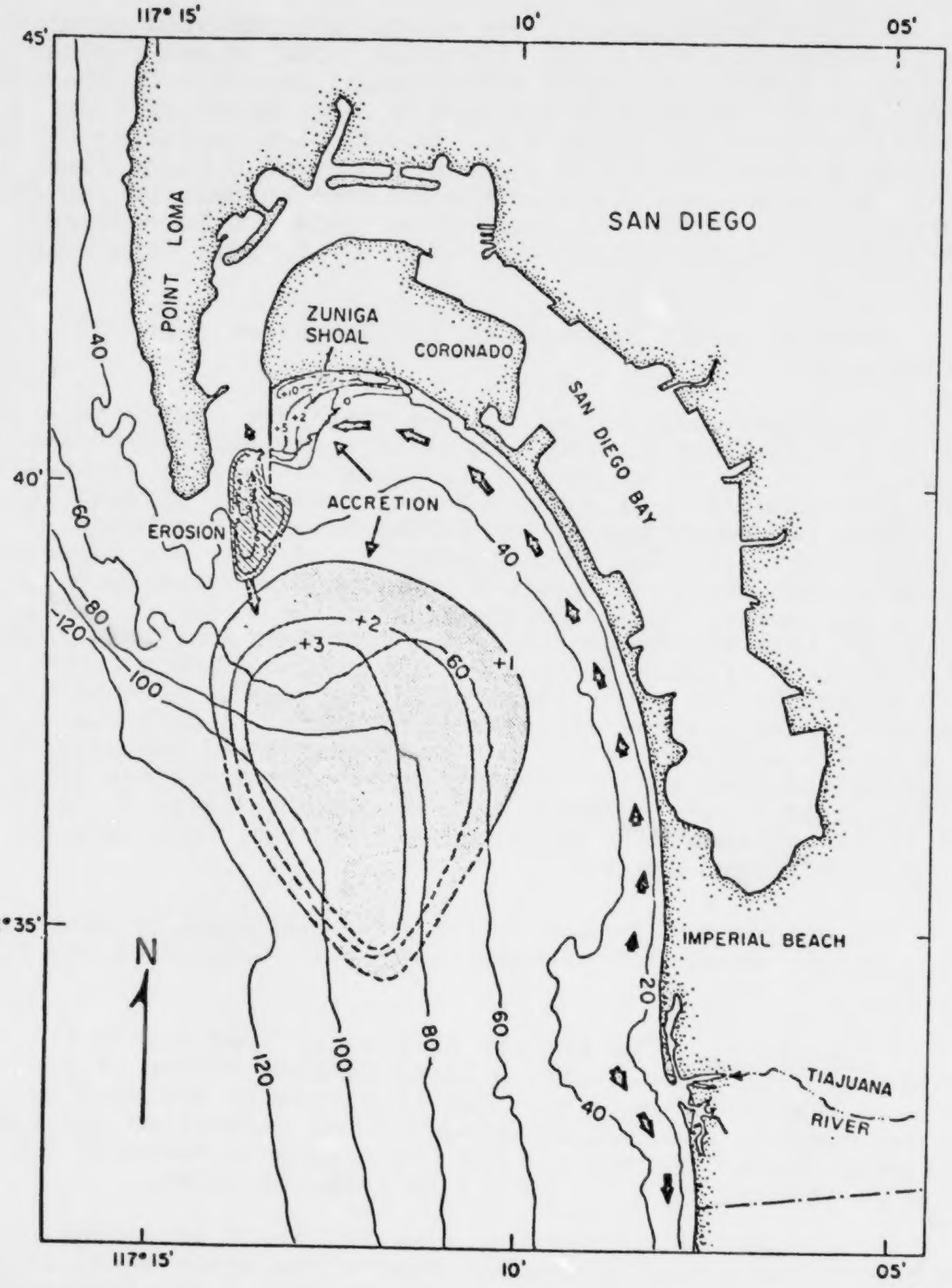


FIGURE II-14. SILVER STRAND LITTORAL CELL.

[showing the Tia Juana River as the former source of natural sand, the littoral transport paths north along the Silver Strand, and the deposition areas; the final deposition area is the offshore region indicated by the isolines determined by comparing surveys of 1923 and 1934. (Source: Inmann, 1973)].

Source: Peeling, 1974.

10 miles in width. The entire shelf is characterized by a terraced topography. It is indented by the La Jolla-Scripps submarine canyon, which terminates less than a mile from Point La Jolla (Southern California Coastal Water Research Project, 1973).

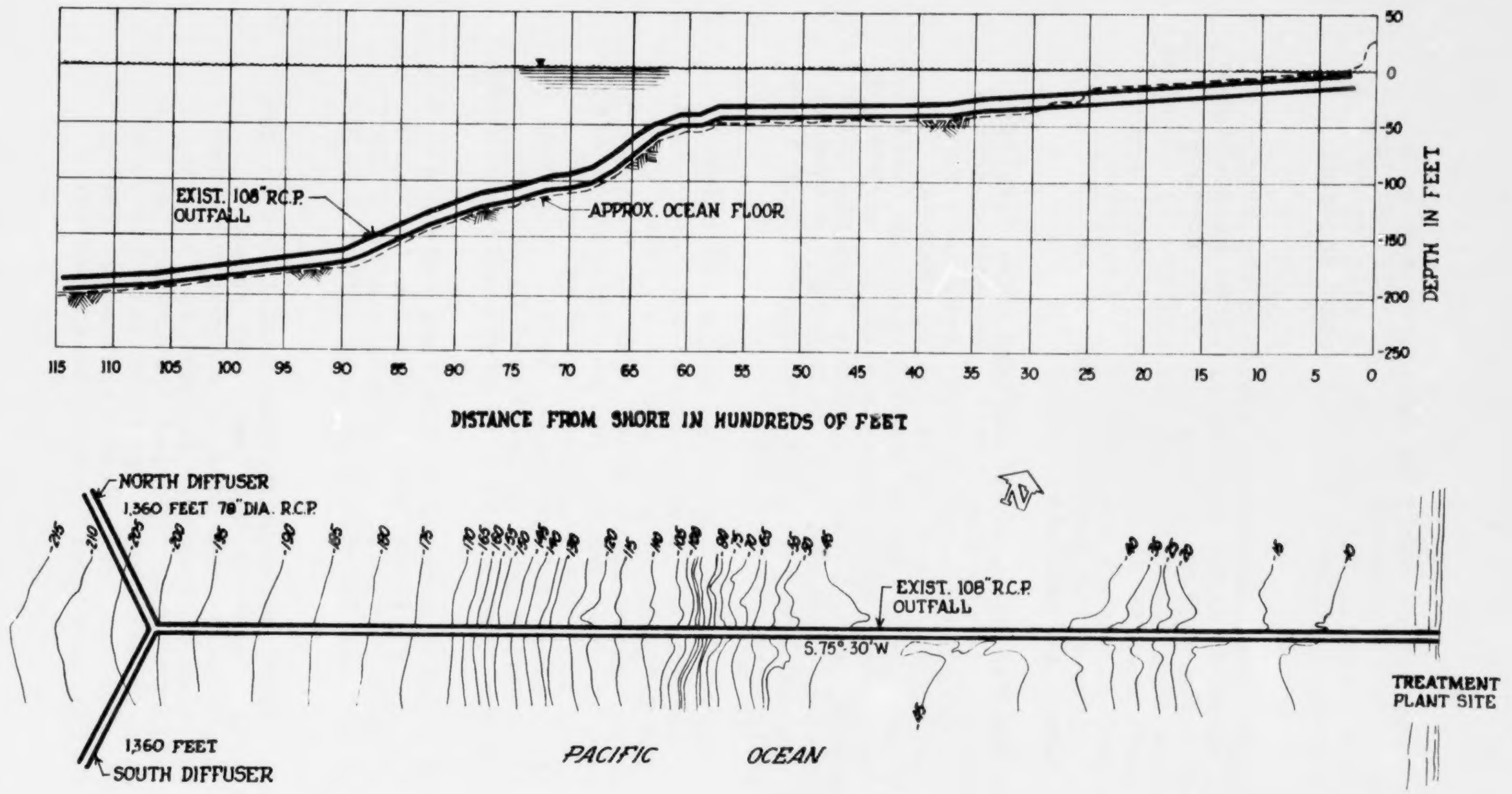
Bottom Sediments. The continental shelf in the study area is covered by sandy or silty sediments, although scattered rock outcrops occur. The sediments have four main sources: 1) submerged terraces of ancient terrestrial origin; 2) alluvial depositions from local rivers; 3) transport by littoral and offshore currents; and 4) plants and animals, which form organic sediments. River-borne sediments are the major present-day input (Lowry & Associates, 1976).

The Oceanside and San Diego shelf regions have distinct sediment characteristics (Stevenson, 1961). Oceanside Narrow Shelf deposits are typically average-sorted, very fine sand to a depth of 50 feet as far south as La Jolla. Between La Jolla and Point Loma medium sands predominate; the nearshore area is primarily an exposed sandstone-shale shelf, strewn with cobbles and boulders (Turner, 1968). Offshore from the 100-foot contour, medium sands predominate, decreasing in size to coarse silts both seaward and southward. A long tail of finer sediments curves south from Mission Bay.

The San Diego Shelf complex contains sands and silty sands. Two kinds predominate: a well-sorted fine gray sand, near the mouth of the Tijuana estuary, and an average to well-sorted, medium to coarse brown sand. Nearshore sediments are well-sorted brown or gray sands. The particle sizes are coarse within the surf zone and decrease to a depth of 30 feet (Stevenson, 1961; Lowry & Associates, 1976). Littoral sedimentation south of Point Loma is described by Peeling (1974) and Nordstrom and Inmann (1973) as previously mentioned.

The Point Loma outfall extends 11,500 feet offshore from the treatment plant on Point Loma. As shown in Figure II-15 it crosses several terraces, and discharges in a flat gently sloping area between 200-215 feet deep (Brown & Caldwell, 1973).

Turner et al., (1968) surveyed bottom conditions in the outfall area to a water depth of 100 feet. As shown in Figure II-16, he found coarse red sand to a depth of about 30 feet (about 3,000 feet offshore). Between 40-75 feet (4,500-8,000 feet offshore), he reported "pavement-like sandstone". The edge of the shelf, approximately 100 feet deep and 8,500 feet offshore, contained "scattered, large, rocky outcroppings, but interspersed with extensive sandy

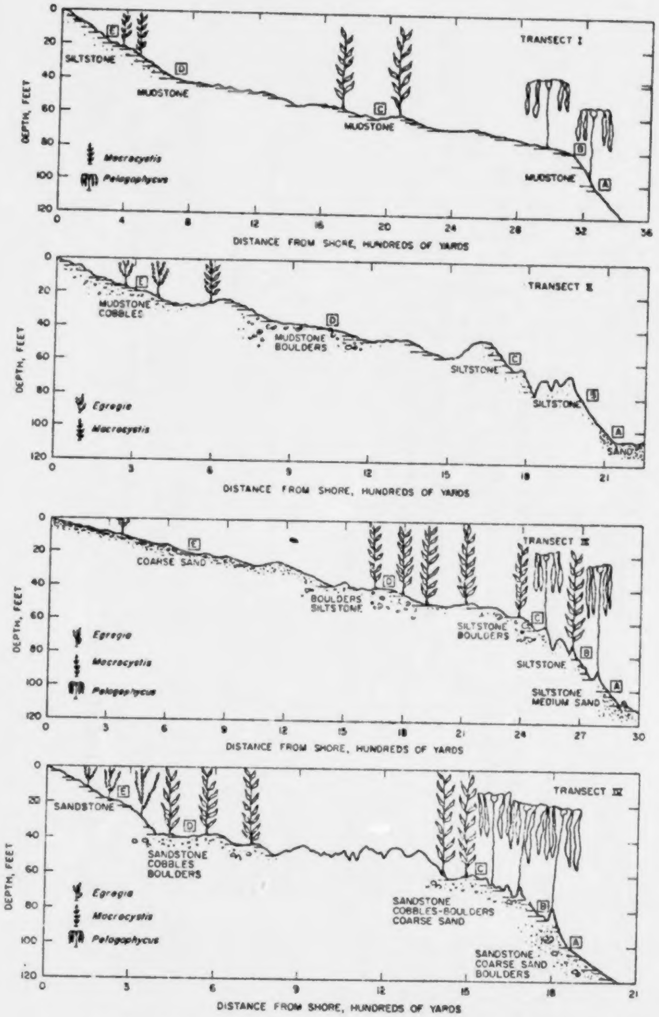


SOURCE : BROWN AND CALDWELL

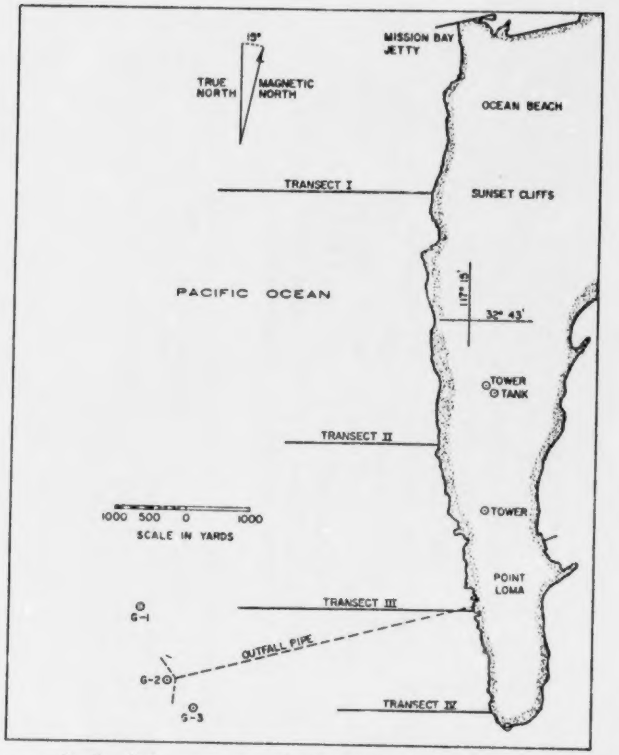
PLAN AND PROFILE OF OCEAN OUTFALL

FIGURE II-15

Source: Brown & Caldwell, 1973.



Bottom contours offshore from Point Loma, San Diego County, as interpreted from fathograms. The letter within the square indicates the sampling station.



Location chart, transects surveyed and offshore collection sites, Point Loma, San Diego County.

Figure II-16

Source: Turner, 1968.

areas". At the extremity of Point Loma, roughly 1,000-1,500 feet south of the outfall, the bottom is irregular, exposed sandstone or mudstone, strewn with cobbles and boulders, and scarred with sand-filled rifts. The area immediately surrounding the outfall is not described by these transects, but was subject to grab and core samples (stations 6-1, 6-2, 6-3 on Figure II-16). A sludge layer of varying thickness characterized by the presence of hydrogen sulfide was noted. The extent of the area thus affected was not delimited. Tables II-27 and II-28 document some of the changes in Point Loma sediments attributed to the outfall discharge.

Generally the discharge of treated sewage enriches local sediment levels of organic carbon and biological oxygen demand (BOD), and increases biomass production. The final disposition of discharged solids is affected by decomposition as well as physical and biological redistribution.

Oceanography

The ocean has a great effect on design of ocean outfalls and on their effectiveness for the disposal of wastewaters. The temperature, salinity and thus density of the receiving waters greatly influence initial dilution of the effluent. Water transport patterns determine its subsequent dispersal. Together, they are the primary determinants of the zone and intensity of environmental effect of the effluent.

Physical Characteristics of Receiving Waters. The pH, salinity, temperature, density and stratification of the waters over the Southern California Shelf were recorded by Tibby during 1956-60 (Stevenson, 1961) and generally represent pre-outfall conditions. Point Loma outfall area water quality was surveyed by Environmental Quality Analysts (EQA) on December 14, 1972 (Brown & Caldwell, 1973). In addition, Orlob (1975) has reported temperature data for the outfall area from January 1972 through December 1974. The data used here are drawn primarily from Tibby's work to illustrate background conditions.

pH. Measurements of pH showed the sea to be typically well buffered. Recorded values ranged from 7.5 to 8.6, averaging 8.1. They decreased slightly with depth.

Measurements in the Point Loma vicinity prior to the construction of the outfall yielded average values of 7.95 for surface waters and 7.53 for bottom waters. The range was 6.5-8.4, with most readings between 7.0-8.2 . The EQA

(1973) measurements showed that, on the day of measurement, surface values ranged from 8.34-8.39, decreasing to 8.12-8.27 at 200 feet. No unusual readings were reported near the outfall.

Salinity. Tibby found salinity values to be fairly constant along the shelf. At all points, for all seasons, mean values were generally between 33.50 and 33.75 parts per thousand (o/oo). The single exception was the area south of San Diego during the months of April-June, where mean values were of 34.30 o/oo at the surface and 33.75 o/oo at a depth of 200 feet. The range of values is given in Table II-13.

Table II-13

SALINITY VALUES (o/oo) OVER THE SOUTHERN CALIFORNIA SHELF, 1956-60

Area	Surface	100 Feet	200 Feet
Carlsbad-La Jolla	33.42-33.93	33.38-34.06	33.42-33.96
La Jolla-Point Loma	33.42-33.93	33.40-33.92	33.45-34.03
Point Loma-Mexican Border	33.33-33.88	33.42-33.88	33.42-34.15

Source: Tibby, 1961.

Brown & Caldwell reported mean values of 33.86 o/oo at the surface and 33.82 o/oo at 200 feet. The mean difference between the surface and 200-foot readings was 0.1 o/oo. No unusual salinity readings were reported to occur immediately around the outfall.

Temperature. Water temperature shows strong seasonal variations at all depths. Surface temperatures shown by Orlob (Figure 11-17) varied from 55°F in the winter to 70°F in the summer. Bottom temperatures varied from 48-59°F. The greatest differences between surface and bottom temperatures occurred during the summer months, when temperature gradients showed a sharp discontinuity (thermocline) at about 50 feet. The thermocline weakened or disappeared in the winter. Tibby found no substantial differences between the Point La Jolla-Point Loma area and the area south of Point Loma, except that bottom temperatures were 3-7°F colder during January-March in the latter area.

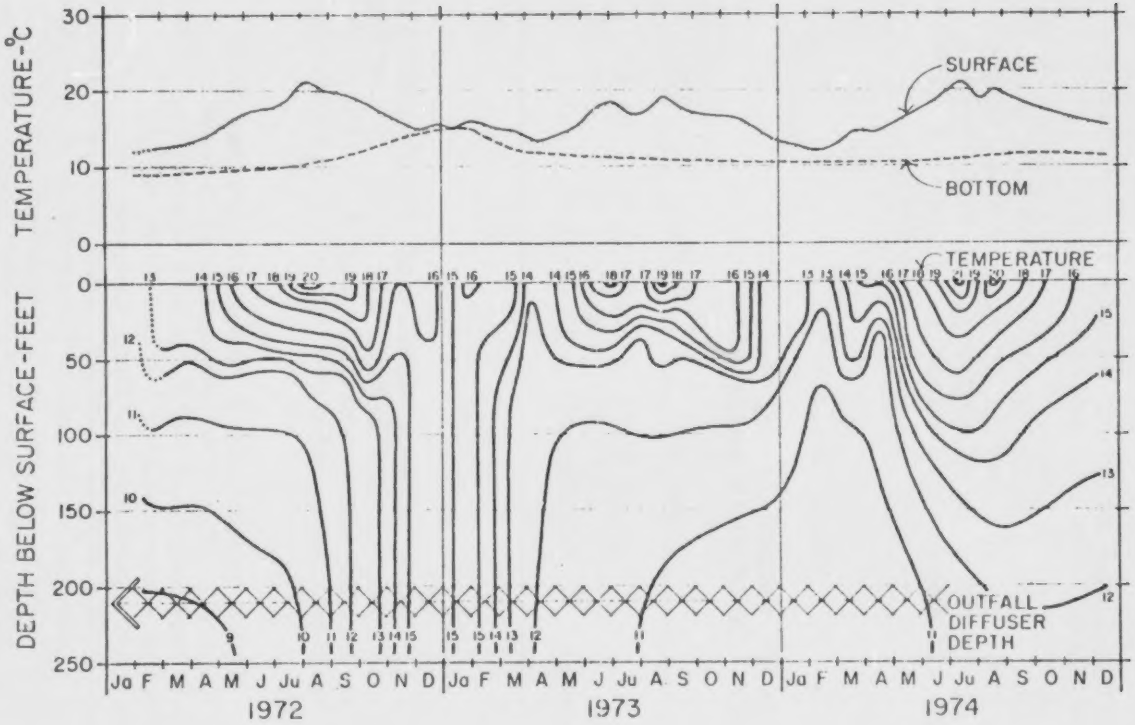


Figure II-17
TEMPERATURE STRUCTURE IN THE VICINITY
OF POINT LOMA OUTFALL, 1972-1974

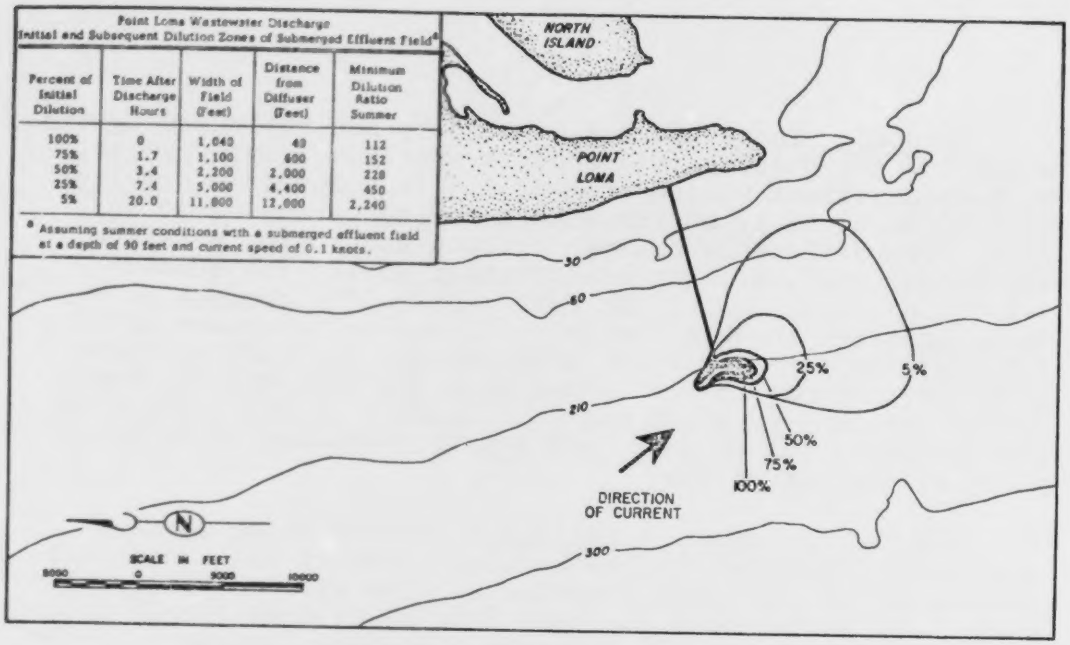
Source: Orlob, 1975.

Density. Temperature and salinity are reflected by the overall water density (measured in specific gravity units). Surface densities varied from 23.3 (i.e., specific gravity of 1.0232) to 25.1; bottom waters varied between 25.0 and 26.0. The difference between surface and bottom persisted throughout the year, but was greatest during the summer (~2.0) and least during the fall (~0.8). No obvious differences appeared between the Point La Jolla-Point Loma area and the area south of Point Loma, except that the surface-bottom difference in the latter area was somewhat greater during the January-March months. Brown & Caldwell reported surface densities of 24.83 and bottom densities of 25.08 under winter conditions.

Initial Dilution of Effluent. The vertical density gradient is critical to the initial dilution and subsequent dispersion of the outfall effluent. The effluent is freshwater, and warmer than the sea; thus it is immediately buoyed upward through the colder, denser seawater. It rises to the level of the thermocline, where it is forced to disperse laterally. The deeper the thermocline, the more restricted the initial dilution field. When the thermocline is weak or absent, the diluted effluent may rise to the surface. Brown and Caldwell have calculated the initial dilution factors at 112:1 (summer, strong thermocline conditions) and 253:1 (winter, weak thermocline conditions), and depicted the area in which this is most likely to occur (Figure II-18). The waste field reaches the surface at the highest dilution ratios. Some of the dilution water is actually diluted wastewater brought back into the plume by eddy currents. Initial dilution factors are computed mathematically and under idealized conditions and as such, represent reality only approximately. It is thought that the submerged field is more desirable than a surfacing waste field because of increased protection of nearshore resources. The dilution factors are well within the State Water Resources Control Board guidelines of 100:1 (at least 50 percent of the time) and 80:1 (at least 90 percent of the time).

Currents, Tides and Waves. Currents off the San Diego coast vary by season and depth. Subthermocline currents can differ substantially from surface currents, which are more subject to the effects of wind and tide (Southern California Coastal Water Research Project, 1973).

Oceanic Currents. The prevailing oceanic (geostrophic) surface currents shown in Figure II-19 vary with the relative strengths of the southern California counter current, which flows generally northeast along the coast and an opposite

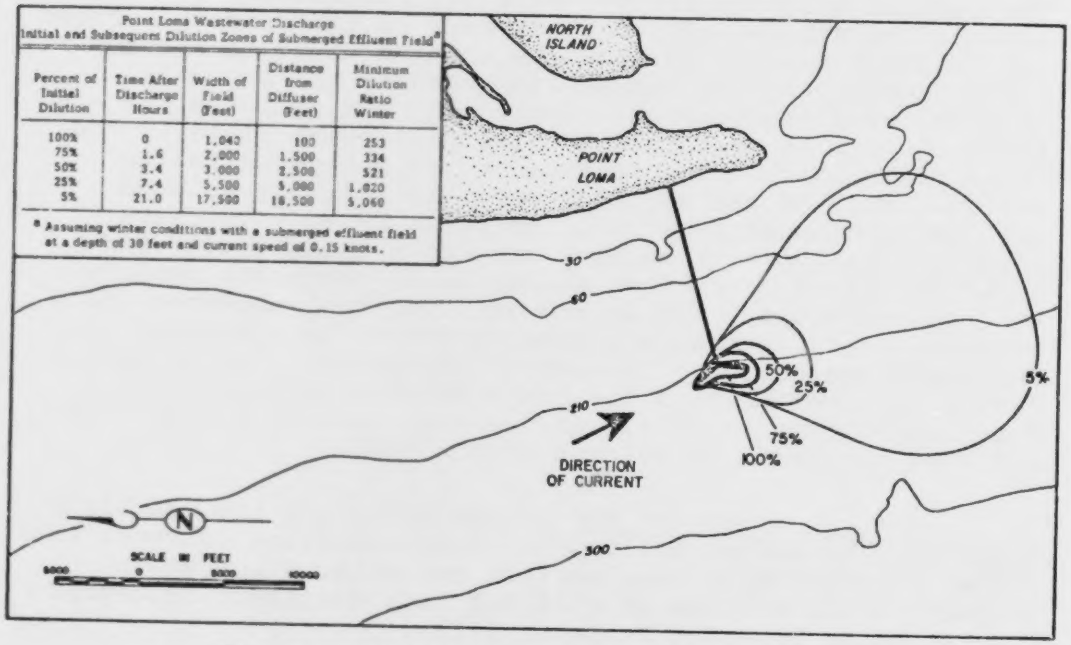


Point Loma Wastewater Discharge
Initial and Subsequent Dilution Zones of Submerged Effluent Field[a]

Percent of Initial Dilution	Time After Discharge Hours	Width of Field (Feet)	Distance from Diffuser (Feet)	Minimum Dilution Ratio Summer
100%	0	1,040	40	112
75%	1.7	1,100	600	152
50%	3.4	2,200	2,000	228
25%	7.4	5,000	4,400	450
5%	20.0	11,000	12,000	2,240

[a] Assuming summer conditions with a submerged effluent field at a depth of 90 feet and current speed of 0.1 knots.

Zones of Initial and Subsequent Dilution of Effluent Near Point Loma – Summer Conditions



Point Loma Wastewater Discharge
Initial and Subsequent Dilution Zones of Submerged Effluent Field[a]

Percent of Initial Dilution	Time After Discharge Hours	Width of Field (Feet)	Distance from Diffuser (Feet)	Minimum Dilution Ratio Winter
100%	0	1,040	100	253
75%	1.6	2,000	1.500	334
50%	3.4	3.000	2.500	521
25%	7.4	5,500	5,000	1.020
5%	21.0	17,500	18,500	5,060

[a] Assuming winter conditions with a submerged effluent field at a depth of 30 feet and current speed of 0.15 knots.

Zones of Initial and Subsequent Dilution of Effluent Near Point Loma – Winter Conditions

Figure II-18

Source: Brown & Caldwell, 1973.

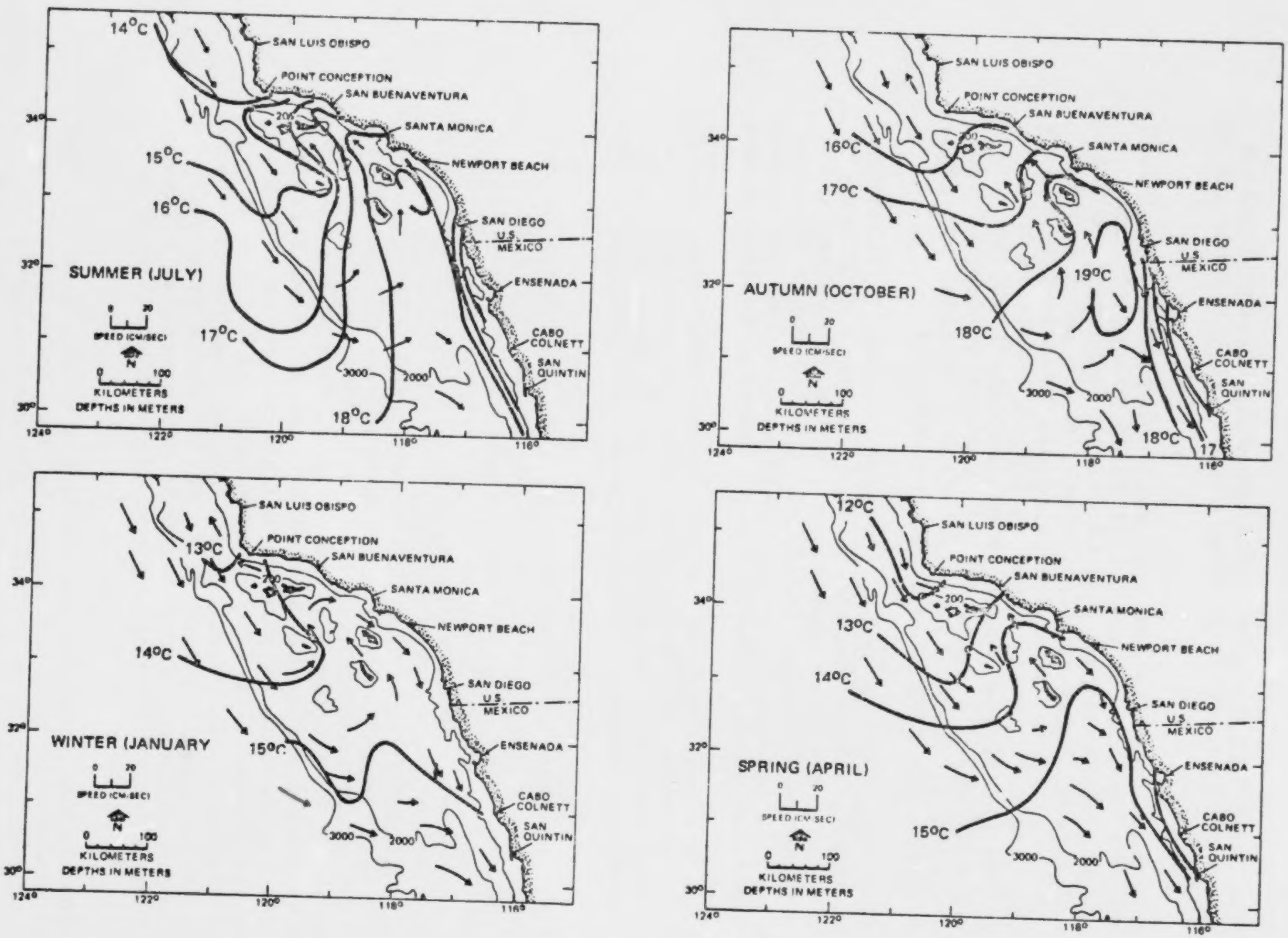


Figure II-19

AVERAGE GEOSTROPHIC SURFACE FLOW (ARROWS, 0-100 M) AND SURFACE ISOTHERMS (DEGREES C) IN THE SOUTHERN CALIFORNIA BIGHT

Source: Southern California Coastal Water Research Project, 1973.

southwest, longshore current. The opposing current develops when the countercurrent is weak or absent, most notably during winter and spring.

Subsurface currents are less well understood. Hendricks (1976) has found that, at depths of 41-56 meters off the coast between Santa Barbara and San Diego, subsurface currents generally flowed longshore (i.e., parallel to local contours). Within the study area, mean speeds ranged from 16 feet/minute off Point Loma to 22 feet/minute at Solana Beach-Del Mar. About 75 percent of the longshore motion came from low-frequency currents (<1 cycle daily), presumably derived from oceanic currents. About 20 percent came from tidal currents, with the remainder from high-frequency currents

Tidal Oscillations and Wind Stress. Tidal oscillations and wind stress affect oceanic surface currents much more than subsurface currents, sometimes completely masking the oceanic patterns (Southern California Coastal Water Research Project, 1973; Stevenson, 1961). Wave action does not affect water transport significantly, but it does aid surface mixing.

Along the Pacific Coast, tidal cycles occur twice daily, but are of markedly different amplitudes. In southern California, they vary from less than one foot to more than 10.0 feet, and follow diurnal, monthly (lunar) and annual periodicities.

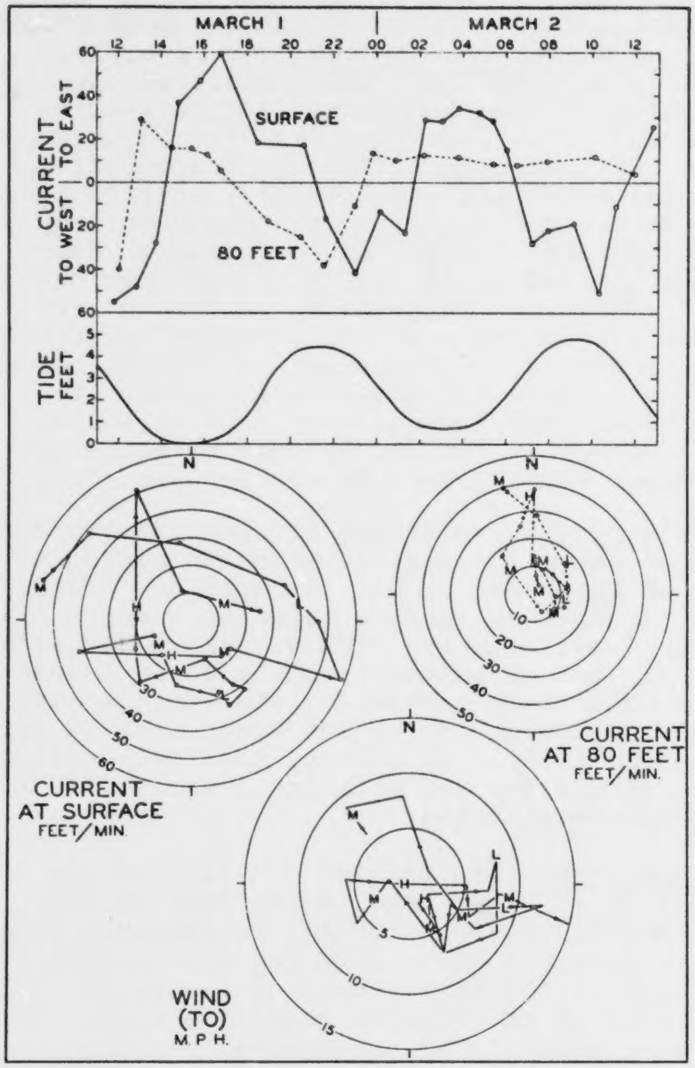
Tidal currents occur as the high tide wave draws water toward the shore (flood tide) or away from it (ebb tide). Along the San Diego coast, currents tend to flow generally north to northwest during flood tide and south to southeast during ebb tide. The velocity of these currents varies with distance from shore and the amplitude of the tide, and inversely with depth and the period of the tide. Irregularities in the coastline and submarine topography, as well as offshore kelp beds, create substantial local variations in the timing and force of tidal currents. These local variations are great enough to induce eddies between weaker and stronger currents. Where the thermocline is strong, and the submarine topography varied, the eddies will involve some vertical as well as lateral mixing of the water. Under proper conditions, these can create an upwelling spot where well-mixed bottom water rises to the surface. Leipper (1955) has presented evidence of such an effect off Scripps pier, 14 miles north of the outfall.

Wind stress imparts a shallow drift to the surface layers of water, which in turn influence the next underlying layer, and so on, to a depth determined by the wind velocity, latitude, and depth of frictional resistance. In the San

Diego area, where local winds are determined mainly by local topography and diurnal heating and cooling, wind stress has an unpredictable effect. Under certain conditions, winds can push the warmer surface layers offshore, bringing colder water to the surface near the shore, thereby inducing upwelling. Wind action may enhance or counteract tidal oscillations. Figure II-20 illustrates surface and subsurface current patterns off Point Loma. Gaul and Stewart (1960) have analyzed the surface drift of current drogues placed off Point Loma and Imperial Beach and attempted to separate the effects of tide and wind. The validity of their conclusions is obscured somewhat because they did not distinguish geostrophic (oceanic) from tidal motion. They found that tidal oscillations imposed elliptical patterns on surface currents, oriented along a generally north-south or northeast-southwest axis. The flow was clockwise off Point Loma and counterclockwise off Imperial Beach. Velocity was generally less than 30 feet/second. The wind measurements were less reliable, but winds over 5 mph seemed to deflect surface currents 10°-25° to the right and account for 3-5 percent of the velocity.

Wave Action. Wave action, although it does not transport significant amounts of water, greatly affects the mixing of the surface layers and the depth of the thermocline. Waves create a well-mixed, isothermal surface layer to a depth of about half the distance between wave crests. Where the water is shallower than that, bottom sediments may also be transported. In southern California generally, the surface layer is about 90 feet deep, although in the San Diego area it may be only 20 feet (Stevenson, 1961). Of course, the depth varies under different wave conditions and with local variations in wind stress and connective stirring.

Dispersion of Effluent. The initial dilution of the effluent plume occurs as it rises from the outfall to the thermocline or, infrequently, the surface. Thereafter, the plume is dispersed by current, wind, tide and wave action. Brooks (1960) and Orlob (1975) have attempted to derive statistical descriptions of the area in which the Point Loma effluent will most probably be measurable. Brooks (Figure II-21) shows the area in which the coliform MPN would not be expected to exceed 11/ml more than 5 percent of the time, or 10/ml more than 20 percent of the time. Orlob (Figures II-22 and II-23) plots statistical analyses of the area where sediment BOD measurements exceeded the recorded pre-outfall background level (1962-63) of 1.5 mg/l. Both studies suggest the effluent is dispersed to trace concentrations within an area extending roughly from



Currents relative to tide height in an area 120 feet deep off Point Loma, San Diego, on March 1 and 2, 1957. Upper lines (solid for surface measurements, dashed for 80-foot measurements) show tidal current in terms of flood and ebb (to east and west, respectively); note that maximum current was usually earlier than midtide and that currents at surface and 80 feet were out of phase. Lower diagrams show current ellipses having clockwise rotation with time, except when currents were slow and erratic. Times of high, middle, and low tides are indicated by H, M, and L. Note the rotation to right of currents at depth with respect to those at surface. Variation in wind direction shown in bottom polar diagram; note that the wind happens to be nearly in phase with tide so that current ellipses may be products of both wind and tide. Based on drogue measurements by Geological Diving Consultants, Inc., for city of San Diego.

FIGURE II-20. CURRENTS RELATIVE TO TIDE HEIGHT

Source: Emery, 1960

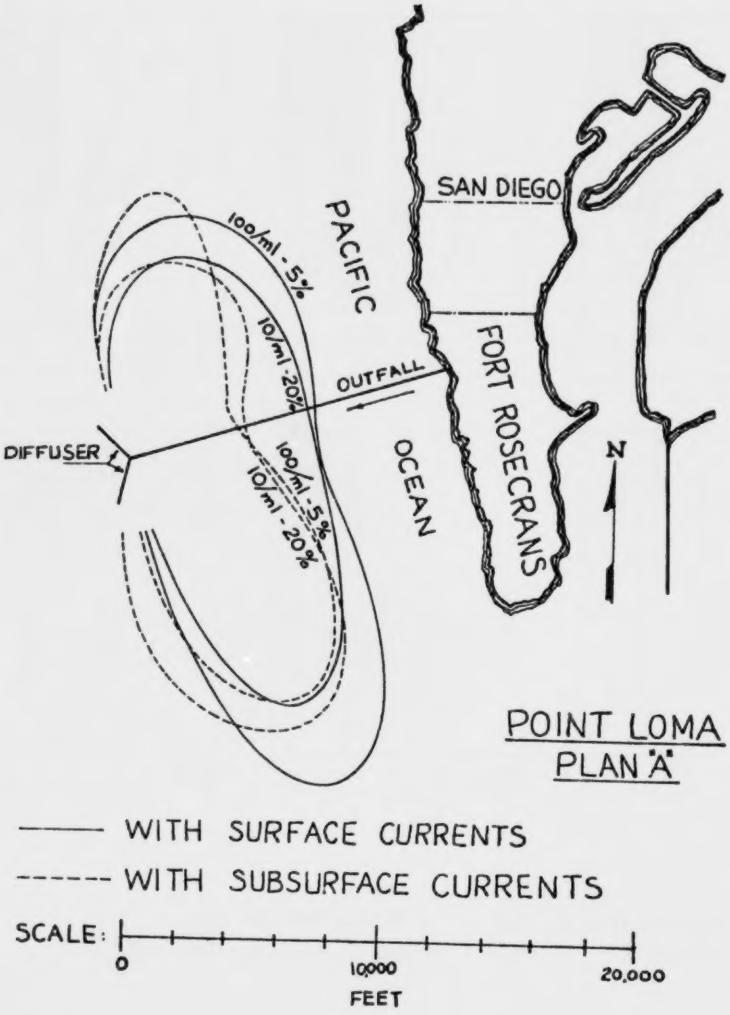
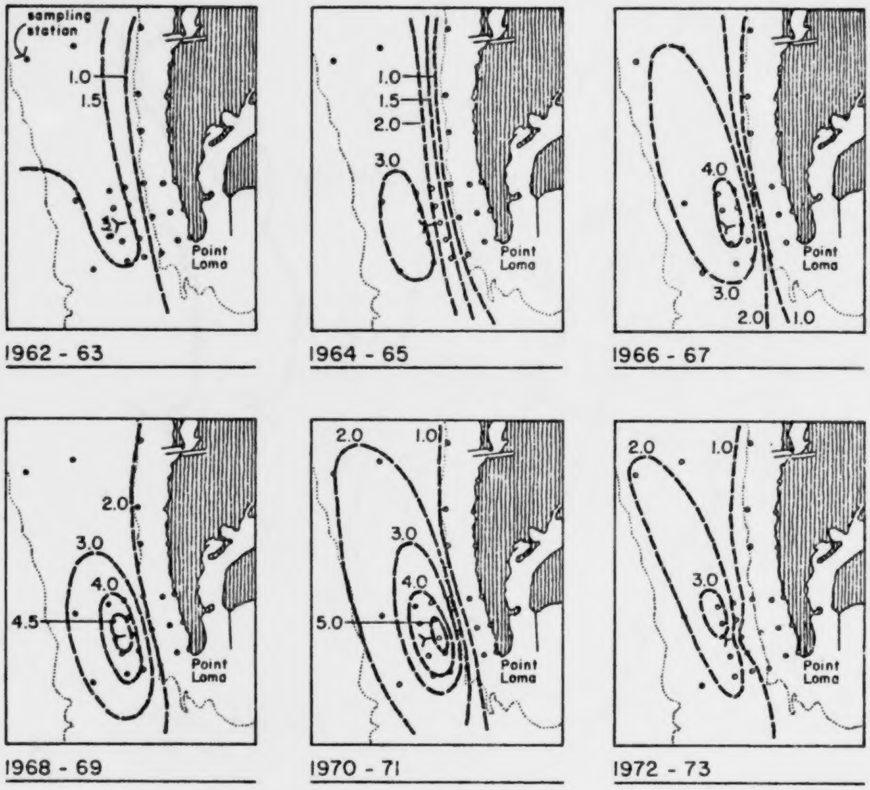


Figure II- 21

Theoretical limit beyond which coliform MPN will not exceed 10/ml more than 5 percent of the time, or 100/ml more than 20 percent of the time, with surface and subsurface currents.

Source: Brooks, 1960.



1962 - 63

1964 - 65

1966 - 67

1968 - 69

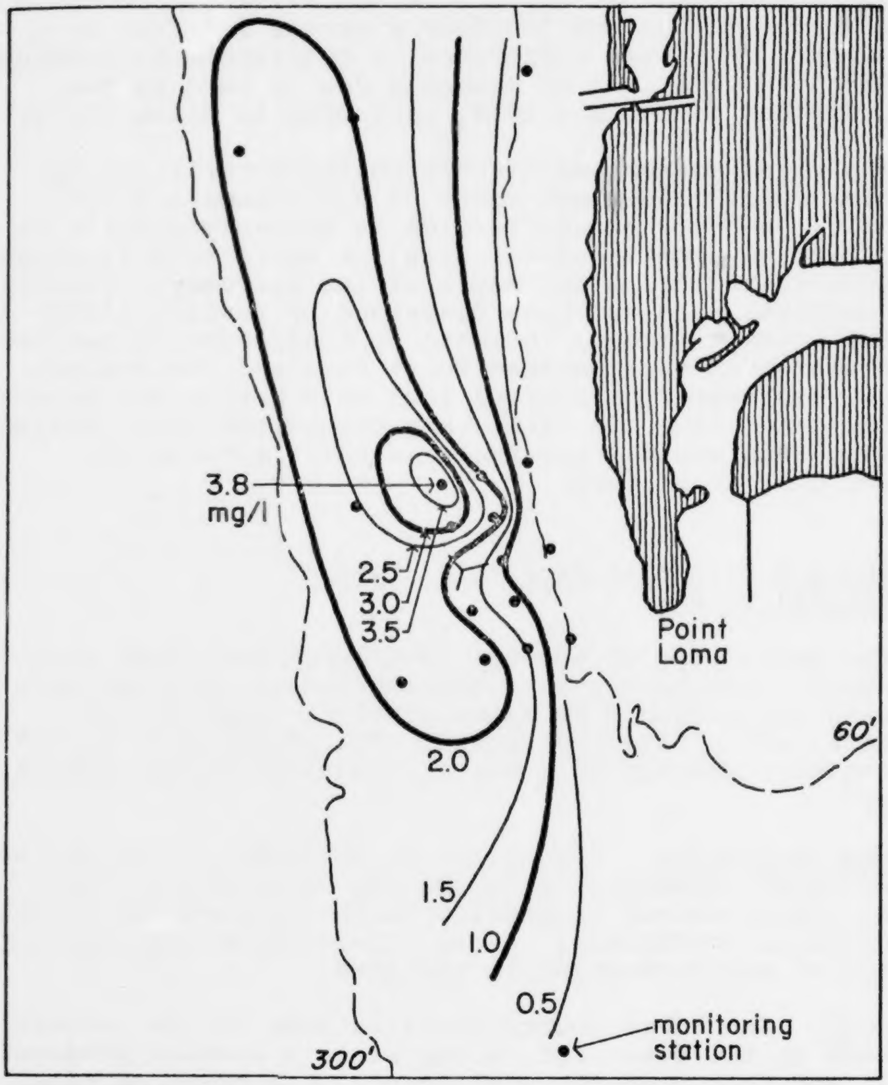
1970 - 71

1972 - 73

BIOCHEMICAL OXYGEN DEMAND OF SEDIMENTS, VICINITY OF POINT LOMA OUTFALL, 1962-1973

Figure II-22

Source: Orlob, 1975.



SEDIMENT B.O.D. IN VICINITY
OF POINT LOMA OUTFALL, WINTER 1973-1974

Figure II-23

Source: Orlob, 1975.

the southern extreme of Point Loma, parallel to the shore and between the 100- and 300-foot contours for four to eight miles. A marked difference in BOD isopleths between 1970-1971 and 1972-1973 is probably due in part to raw sludge discharges in late 1968, according to Orlob (1975).

Initial dilution and dispersion characteristics for possible outfall locations south of Point Loma are not available. Density stratification is probably similar to that off Point Loma. Initial dilution would be a function of this stratification and depth of the diffuser. Littoral drift analyses such as those described by Peeling (1974) and Gaul and Stewart (1960), indicate cyclonic current patterns in the nearshore area between Point Loma and the Mexican border. Wastewater discharged into this system may have a long residence time and ultimately change the local environment more than would discharge to a point outside the cyclonic current pattern.

Existing and Potential Beneficial Uses of Coastal Waters

The human uses of coastal waters off San Diego are of five types: sea harvesting; transportation, mining, manufacturing and military uses; recreation; research and education; and effluent disposal. The waters also provide a biological habitat; this use is discussed under "Marine Biology".

Sea Harvesting. Plants, fish, mollusks and crustacea are harvested commercially in the San Diego area. The harvest yields depend critically on the maintenance of proper environmental conditions. Figure II-24 shows the type and location of sea harvesting in the area.

Kelp. San Diego County contains some of the largest kelp beds in the state and is the state's leading producer of kelp and kelp products (California Department of Fish and Game, 1973a). The Kelco Company, San Diego's only commercial harvester, harvests kelp year-round. Kelp algin is used for industrial and pharmaceutical applications and as a food additive. Gelidium, a sea plant from which agar is extracted, is processed in San Diego, but harvested mainly in Baja California waters (Lowry & Associates, 1976).

Commercial Fishing. A wide variety of fish, mollusks and crustacea are taken commercially in the San Diego area. As shown in Table II-14, the value of the 1974 catch totalled $22,505,713. About 93 percent of this value came from tuna species, most of which are caught outside of the United States

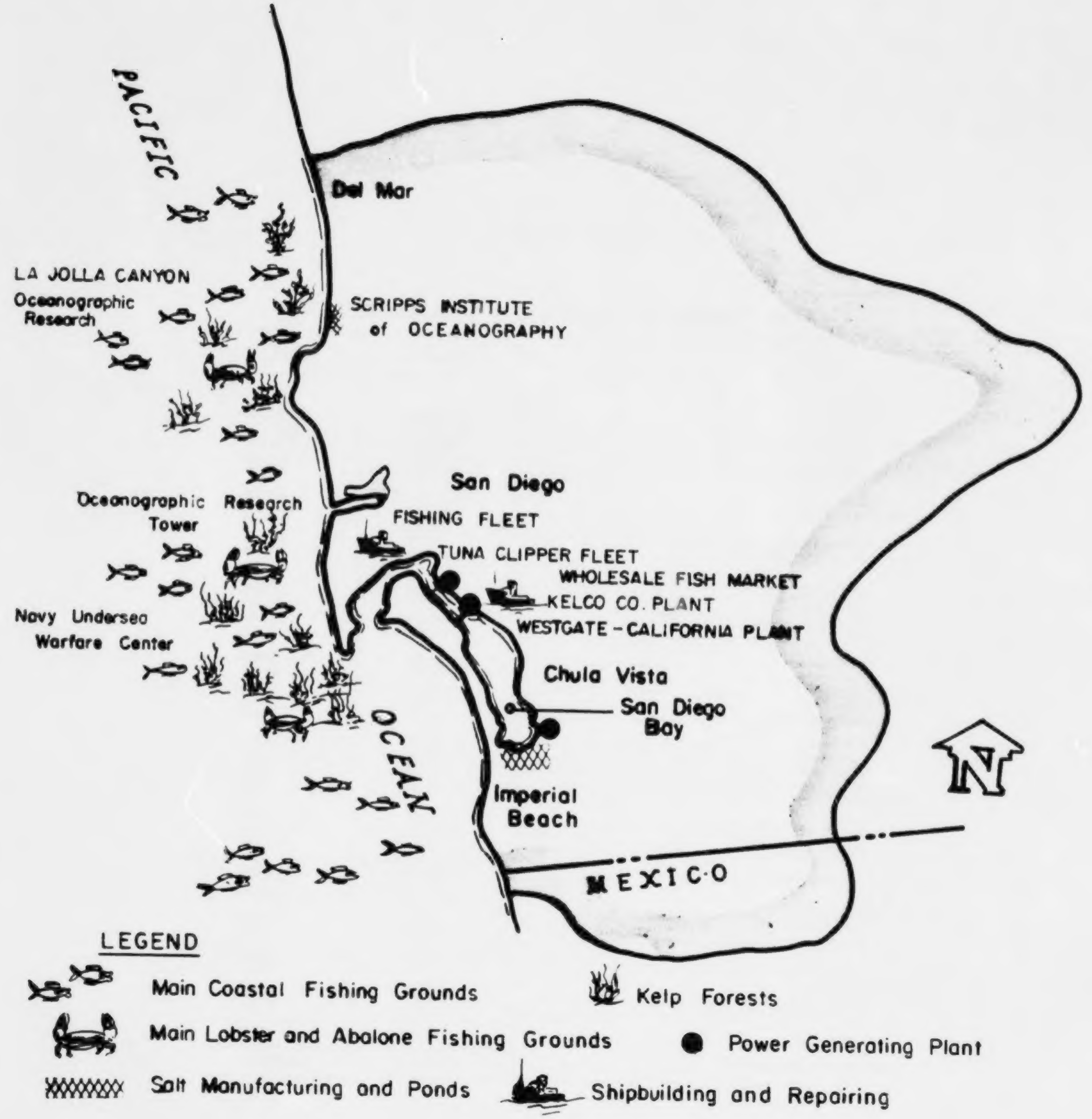

PACIFIC
OCEAN
Del Mar
LA JOLLA CANYON
Oceanographic Research
SCRIPPS INSTITUTE of OCEANOGRAPHY
Oceanographic Research Tower
San Diego
FISHING FLEET
TUNA CLIPPER FLEET
WHOLESALE FISH MARKET
KELCO CO. PLANT
WESTGATE - CALIFORNIA PLANT
Navy Undersea Warfare Center
Chula Vista
San Diego Bay
Imperial Beach
MEXICO
N
LEGEND
Main Coastal Fishing Grounds
Kelp Forests
Main Lobster and Abalone Fishing Grounds
Power Generating Plant
Salt Manufacturing and Ponds
Shipbuilding and Repairing

FIGURE II-24

SEA—HARVESTING
SEAWATER—UTILIZATION
RESEARCH and EDUCATIONAL USES

Source: Lewis & Associates, 1976.

Table II-14

Value of Landings and Shipments by Port, San Diego Area, 1974

	Pounds	Value
San Diego		
Landings:		
Yellowfin tuna	48,871,969	$14,045,804
Skipjack tuna	19,313,932	5,205,105
Bluefin tuna	3,936,052	1,092,648
Albacore	1,225,331	457,906
Pacific bonito	2,387,729	320,433
Rockfish	1,194,234	297,262
White seabass	345,389	210,964
Swordfish	152,939	209,802
California spiny lobster	57,284	107,184
Bigeye tuna	240,369	69,106
Sculpin	137,288	50,865
Red abalone	61,866	45,236
Pink abalone	61,443	44,540
Black skipjack tuna	580,458	43,534
Shark	117,485	34,960
White abalone	28,342	25,556
Market squid	367,434	21,862
Yellowtail	98,761	18,883
Green abalone	18,558	14,763
California halibut	14,288	10,082
Rock crab	37,792	9,977
Sea urchin	88,665	7,288
Giant sea bass	18,622	6,931
Perch	16,605	5,307
Black abalone	18,069	4,456
Threaded abalone	3,495	1,577
Wahoo	4,677	1,511
All other species	35,900	5,967
Total landings	79,434,976	$22,369,509
La Jolla		
Landings:		
Swordfish	1,872	$2,568
All other species	1,062	263
Port totals	2,934	$2,831
All other ports		
California spiny lobster	2,379	$4,452
All other species	3,642	878
Totals	6,021	$5,330
SAN DIEGO AREA TOTALS	79,443,931	$22,377,660

Source: California Department of Fish and Game, 1976.

waters. The remaining 7 percent was derived mainly from abalone (five species), swordfish, white seabass, spiny lobster, rock fish, sculpin, and Pacific bonito (California Department of Fish and Game, 1976). All of these, except swordfish and Pacific bonito, are closely associated with kelp beds, although only the red and green abalone have been reported in the kelp bed off Point Loma (North, 1971; Turner, et al., 1968). A few minor species, such as the halibut, prefer sandy inshore areas; the remainder of the commercial catch is taken in deepwater areas (Lowry & Associates, 1976).

Aquaculture. In the future, aquaculture of kelp, shellfish, or fish may become profitable. Experimental efforts in this direction include cultivation and transplantation of kelp, building artificial reefs and rearing spiny lobsters (El Wardani, 1977).

Transportation, Mining, Manufacturing and Military Uses. As Figure II-25 shows, most of these activities are concentrated in San Diego Bay. The entrance to the bay is a major shipping lane. The U. S. Navy uses the coast and sea for amphibious warfare practice, naval exercises, and offshore mooring. A few non-military vessels moor along the coast. Marine instrument and equipment manufacturers test their instruments in the offshore waters. Some industries, most notably San Diego Gas and Electric, use seawater for cooling and process water (California State Water Resources Control Board, 1975).

In the future, oil drilling and phosphorite nodule dredge may become profitable beyond the continental shelf, and sand may be taken from nearshore areas (Lowry & Associates, 1976).

Recreation. Recreation is by far the most popular marine activity in the San Diego area. As Figure II-26 shows, nearshore activities include swimming, surfing, skin and scuba diving, clamming, pier and surf fishing, wildlife observation and passive enjoyment. Offshore activities include boating, sport fishing and wildlife observation (Lowry & Associates, 1976). The 39 miles of sea coast in the study area include 11 miles of rocky shore and 28 miles of sandy beach, the majority of which has been set aside for preservation or recreational development (California Coastal Zone Commission, 1975). This coast contains a natural monument, three ecological refuges and reserves, three state beaches, and at least 15 county and city beaches.

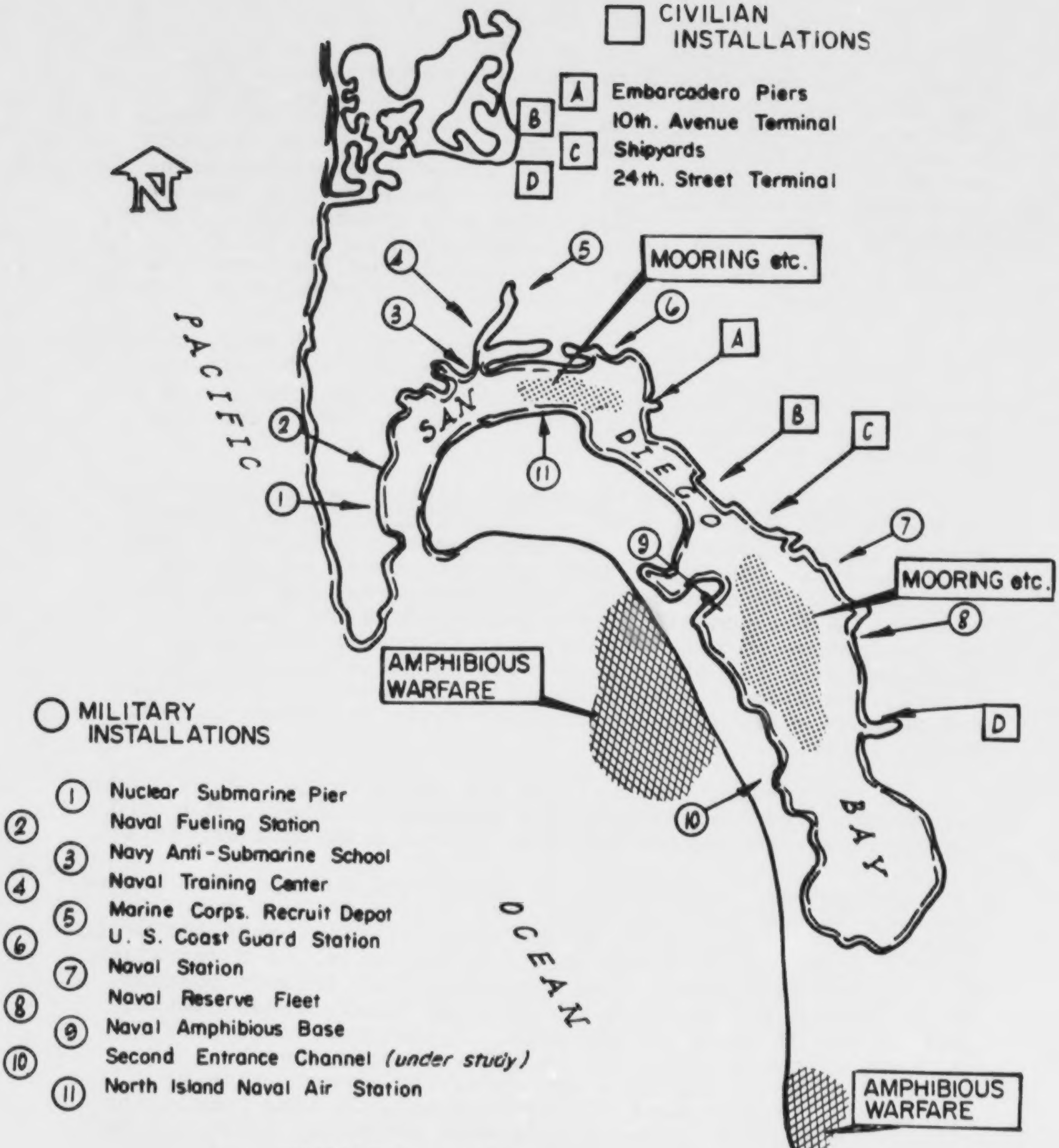


FIGURE II-25

MARITIME TRANSPORT and MILITARY USES

Source: Lowry & Associates, 1976.

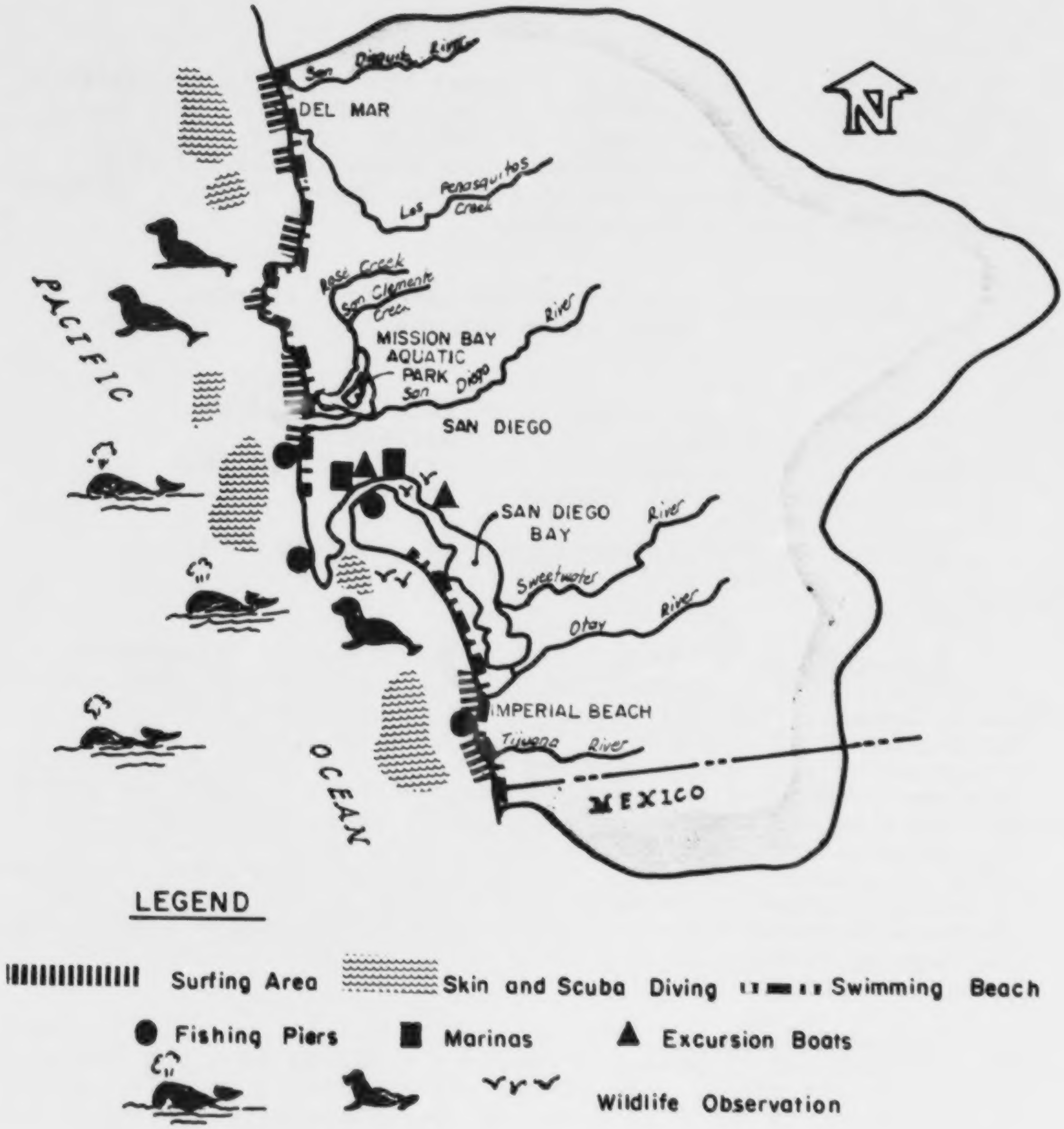


FIGURE II-26

RECREATIONAL USES of MARINE WATERS

Source: Lowry & Associates, 1976.

Sport fishing is popular wherever the coast is accessible. Small craft and party boat fleets operate offshore, mooring in Mission Bay and San Diego. In addition, clams, grunion, surf perch, corbina, and croakers are taken in the littoral zones (California Department of Fish and Game, 1973a). Listed below are the major sport species.

RECREATIONAL FISHING IN THE SAN DIEGO REGION: MAJOR SPORT SPECIES

Abalone
Rockfish
Albacore
Yellowtail
Surf perch
Bonito
Mackerel
White seabass
Kelp and sand bass
Barracuda
California halibut
Lobster

Source: California Department of Fish and Game, 1973a.

Research and Education. San Diego's marine environment is the object of rigorous study, as well as informal observation and enjoyment. The varied submarine topography ranges from the depths of La Jolla-Scripps canyon to the lagoons and estuaries at the land's edge. Scripps Institution of Oceanography is a world-renowned marine research center. At least two other universities and several community colleges, as well as local high schools and elementary schools, use the marine and intertidal environment for teaching or research. Government agencies conducting marine research or field trips in the area include the Naval Undersea Warfare Center, Naval Electronics Laboratory, the Fishery-Oceanographic Center of the Bureau of Commercial Fisheries, and the National Marine Fisheries Service.

Effluent Disposal. The waters off Point Loma provide for the dilution and dispersal of primary effluent from the Point Loma treatment plant. One of the central issues of this report is the extent to which this use is compatible with protected beneficial uses, and how resources are best allocated among competing uses.

Marine Biology

It is beyond the scope of this report to provide a comprehensive review of the marine ecological communities and their interrelationships of the San Diego coastal shelf. This report merely describes briefly the major habitat zones and important species of the area, and focuses on how the Point

Loma outfall may have affected them. Detailed information can be obtained from the cited literature.

The marine environment can be divided broadly into four zones: estuarine, intertidal, nearshore (between the low tide mark and the edge of the continental shelf), and oceanic (Odum, 1971). In this report, the estuarine areas have been treated in the following section, "Bays and Estuaries".

The Point Loma discharger lies in the nearshore zone. The offshore transect defined by the outfall line contains four distinct ecological areas. The surf zone extends about 1,000 feet seaward from shore. The inshore area lies between the surf zone and a kelp bed, which begins about 3,000 feet from shore. The kelp bed extends from 3,000 to 6,000 feet offshore, and seaward of it is open ocean (Brown & Caldwell, 1973). The entire shelf area has been surveyed by divers to a depth of 100 feet (Turner, et al., 1968) and by core samples to the edge of the San Diego-Oceanside shelf, about 300 feet (Stevenson, 1961; Southern California Coastal Water Research Project, 1973).

As shown by monitoring records of July 1971 through December 1972 (Brown & Caldwell, 1973) and July 1973 through February 1975 (Lowry & Associates, 1976), the Point Loma effluent has frequently violated state effluent limitations. The general effects of effluent pollutants are reviewed in Chapter VI. The remainder of this section reviews ecological descriptions of the San Diego-Oceanside shelf area, and studies of the effects of present waste discharge into the area.

Ecological standards of the San Diego Regional Water Quality Control Board are designed to protect beneficial uses.

Ecological Standards.

1. The effluent shall not cause toxicity to exceed 0.05 toxicity units outside of the initial dilution zone.
2. The effluent shall not cause:
    a. A rate of deposition of inert solids and the characteristics of inert solids in ocean sediments to be changed such that benthic communities are degraded.
    b. The concentrations of organic materials in marine sediments to be increased above those which could degrade marine life.

c. Nutrient materials in concentrations that would cause objectionable aquatic growths or degrade indigenous biota.

d. Marine communities including vertebrate, invertebrate, and plant species to be degraded.

e. Alteration of natural taste, odor, and color of fish, shellfish or other marine resources used for human consumption.

Nearshore Habitat Zone. The nearshore habitat zone has been divided into habitats in various ways. The most important divisions are benthic/pelagic, penetration/absence of light (euphotic/aphotic), depth, substrate type (mud, silt, sand, rock), temperature, nutrient availability, and source photosynthetic/detrital), and the presence or absence of wave turbulence. While these conditions determine the major physiological adaptations necessary for survival in a given area, they do not divide the sea into independent habitats. Many species, both bottom dwelling and free swimming, are mobile, and able to move among a wide range of habitats. Other species are mobile during part of their life cycle and sessile during another part. Still others are adapted to a specialized niche and have narrow tolerance ranges. Within the San Diego area, several marine communities and associations have been described (Barnard and Jones, 1961; Fager, 1966; Fager, 1968; North, 1971). However, the overall ecology of the San Diego-Oceanside shelf remains incompletely understood, and accordingly this section is arranged under general topic headings of benthic flora and fauna, kelp beds, plankton, and marine fishes and mammals.

Benthic Flora and Fauna. In 1956-60, personnel of the Allen Hancock Foundation took core samples throughout the San Diego-Oceanside shelf, and assessed the general benthic biology (Barnard and Jones, 1961) mollusks (Jones, 1961), and polychaetes (Hartman, 1961). Turner, et al., in addition to their surveys off Point Loma (1968), have surveyed areas of Canyon de las Encinas (1964) and San Elijo Lagoon (1965). Chen (1970), Chen and Orlob (1972) and Orlob (1975) have investigated the effects of San Diego sludge and wastewater discharges on local sediment conditions. The Southern California Coastal Water Research Project studies (1973, 1976) have also assessed waste discharge effects in the area.

Barnard and Jones found 12 major and 9 minor assemblages of benthic invertebrates, defined by numerically dominant species. The major environmental correlates seemed to be depth (shallow water, 30-90 feet; intermediate, 120-180 feet; deep shelf, 180-360 feet; slope, 360-600 feet) and substrate (mud, fine and silty sand, coarse sand and pebbles, pebbles and rubble, worm tubes, and red sands). Two and perhaps three, of the minor assemblages were characteristic of artificially or naturally polluted sediments: the *Pherusa-Onuphis* complex (both polychaete worms), found near the Whites Point outfall; the *Capitella* (a polychaete) complex, found in organic muds; and *Tharyx*, a tube-building worm which, though widespread, was dominant only in gray and black sediments.

North of La Jolla three assemblages occur. The *Diopatra* (tube-building polychaete) assemblage, usually mixed with other subassemblages, dominates the shallow, rubbly-bottomed areas. The *Nothria-Tellina* (a tube-building polychaete and a small clam, respectively) occurs in the sandy, intermediate-depth areas. The *Amphiodia* (a polychaete) assemblage is found in the fine, sandy silty areas at the shelf edge.

South of La Jolla, the San Diego shelf contains the *Nothria-Tellina* assemblage near the shore and the *Amphiodia* assemblage at its outer edge. However, on the southern half of the shelf, between 90-210 feet, a coarse red sand substrate supports an assemblage dominated by two tube-building polychaetes, *Nothria stigmatus* and *Spiophanes bombyx*. The red sand area also contains a distinct molluscan fauna (Jones, 1961).

Turner, et al. (1968) surveyed four transects off Point Loma (Figure II-16). One transect crossed the outfall and the rest were between one mile to the south and two miles to the north. Most of the transects had rocky bottoms; sandy bottoms occurred only near the base of the outfall (red sand) and at the 100-foot contour (Transect II, fine gray sand).

In general, they found a diverse animal fauna. The dominant flora were red algae (especially in shallow water) coralline algae (all depths), giant kelp (20-75 feet), and elk kelp (deeper water), a typical zonation. Kelp beds are described in a later section of this report. The most diverse fauna occurred in the 60-80-foot range. Grab samples taken near the outfall (220-foot depth) contained soft silty mud with a slight odor of hydrogen sulfide and a few *Capitella* worms, suggesting that the outfall had affected sediment conditions in its immediate vicinity. No detailed analyses of the grab sample contents were made. However, the survey showed that, as of 1965, no large scale adverse changes attributable to the outfall operations were detectable by a rough visual survey.

From September 1964 to January 1967, an equipment failure forced the discharge of digested sludge through the outfall. Raw sludge was discharged from August to December 1968. Thereafter, the plant has operated normally, although hydraulic overloading has become more and more frequent. Orlob (1975), after reviewing the benthic sampling data of 1962-74 (Figures II-27 and II-28), has concluded that:

1. The abundance of organisms present has increased, but the number of species present decreased both near and distant (5 miles or more) from the outfall.

2. Organisms taken near the outfall have been consistently larger than those taken far from the outfall, but there has been a parallel decrease in organism size for both sets since 1962.

3. Total biomass (number of organisms times average weight) increased during the period of sludge discharges, and has declined to previous levels since then.

4. Species diversity has remained stable and consistently higher near the outfall.

5. Of the major groups of animals, polychaetes and mollusks have increased in populations, the greatest increase being near the outfall; crustacea and echinoderms (mostly brittle stars) have maintained greater populations at stations far from the outfall, and the echinoderm population has decreased near the outfall.

6. There have been fluctuations and gradual shifts in the relative abundance of various species, both close to and far from the outfall.

7. During the period of sludge discharges, biostimulation seems to have been greatest about 1.5 km from the outfall; closer to the outfall, the number of organisms decreased.

Monitoring data may often not be adequate to precisely identify cause and effect relationships. However, this does not mean that such relationships do not exist; in the absence of clear-cut evidence, inference and judgment must be used. Thus, we would infer the Point Loma discharge has greatly influenced the benthos within 5-8 miles of the outfall,

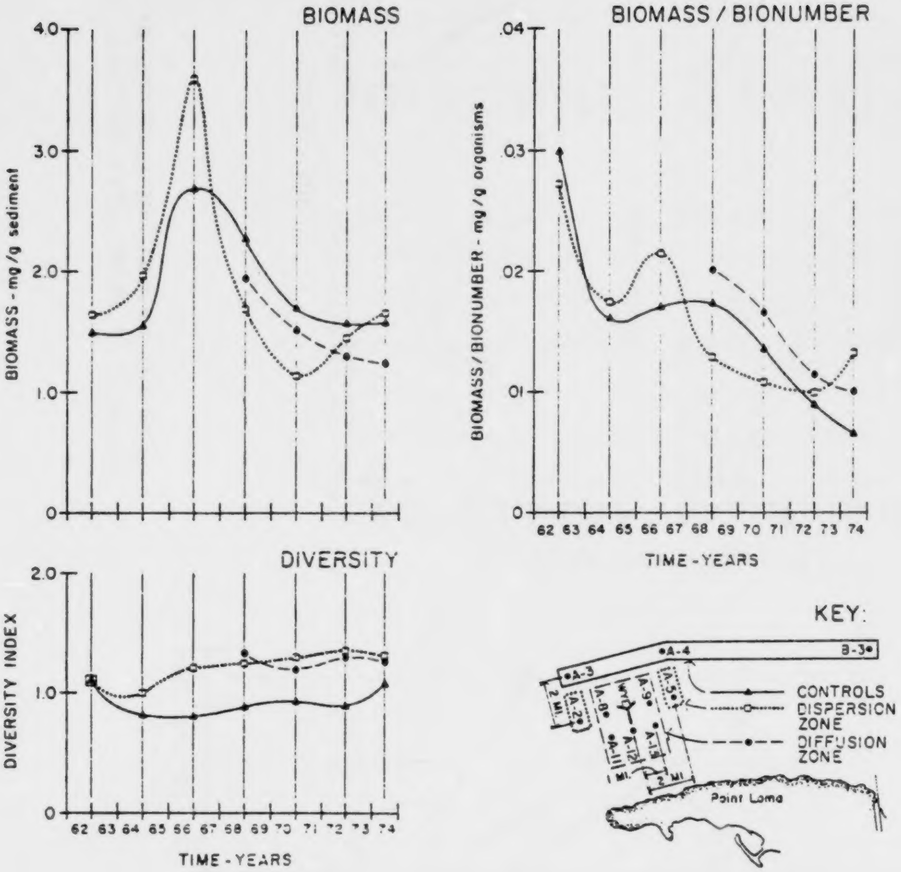
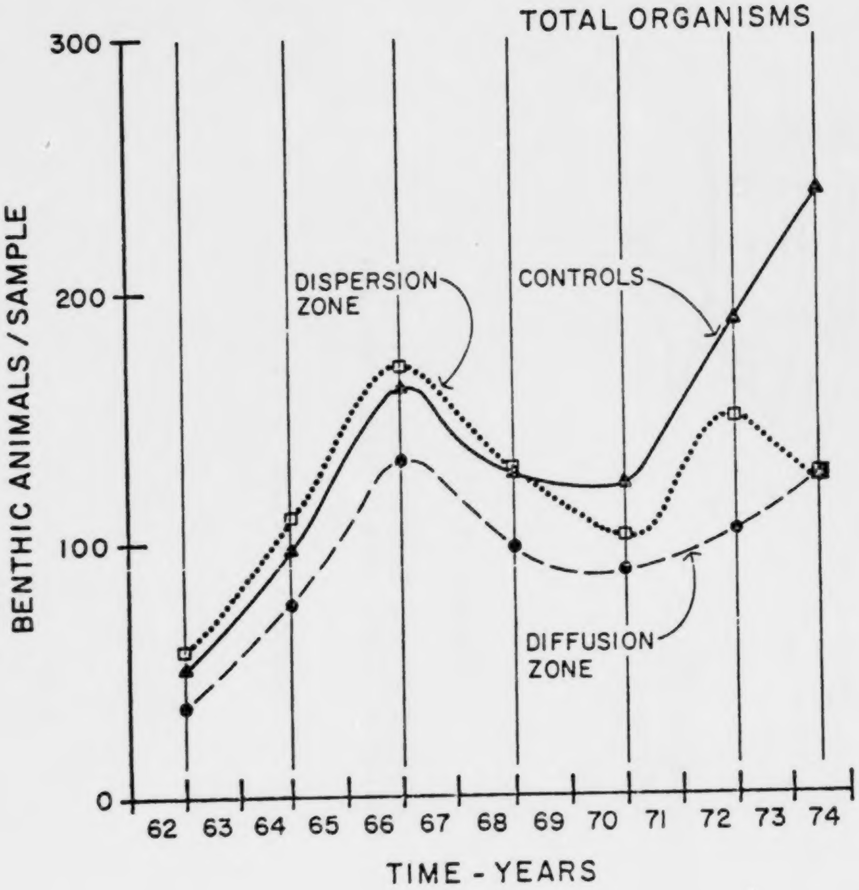


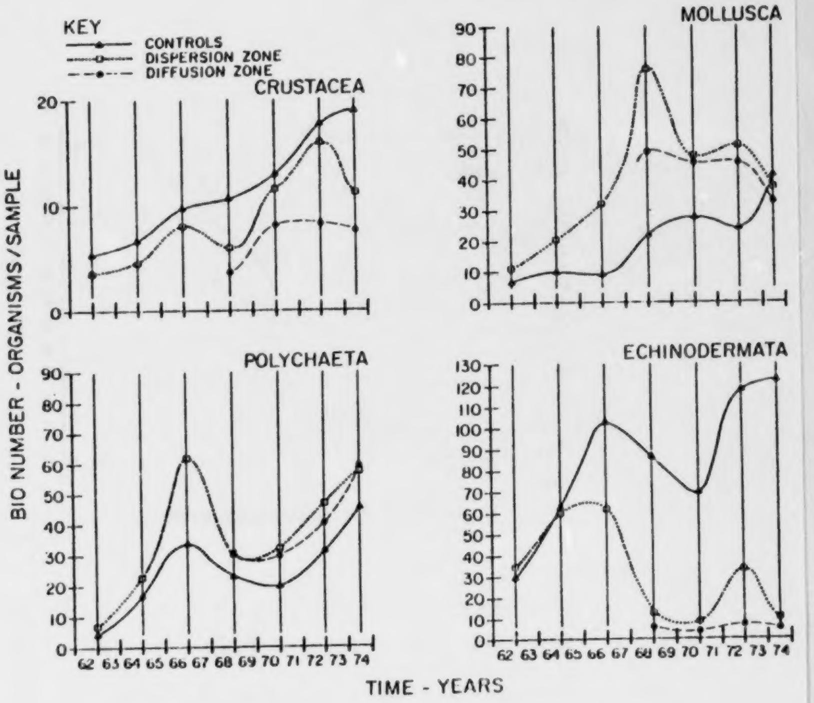
Figure II-27

BENTHIC ANIMAL BIOMASS AND DIVERSITY
VICINITY OF POINT LOMA OUTFALL, 1962-1974

Source: Orlob, 1975.



BENTHIC ANIMAL POPULATION
VICINITY OF POINT LOMA OUTFALL, 1962-1974



BENTHIC ANIMAL POPULATIONS BY FAMILIES
VICINITY OF POINT LOMA OUTFALL, 1962-1974

Figure II-28

Source: Orlob, 1975.

although the trends observed may also reflect environmental changes occurring independently of the discharge. Orlob (1975) tentatively concluded that heavy metal levels in sediments and benthic organisms were not correlated with proximity to the outfall, and that "heavy metal concentrations are generally low, probably not at levels that would be considered biologically inhibitory." This is not equivalent to saying the outfall has no effect. Sediment transport may effectively eliminate the gradient in sediment metal levels, resulting in higher area-wide levels. The data suggest that Orlob's controls were also influenced by the discharge. In the absence of adequate control levels, it is difficult to determine the area-wide effects of the outfall. A comparison of Tables II-29 and II-30 suggests that "controls" (deeper sediments) may be either lower or higher in concentration, depending on the metal.

"Biologically inhibitory" levels of metals in organisms, sediments or water are not known to the extent that one can forecast _in situ_ effects, particularly concerning chronic toxicity and effects at the supra-organismal level (populations, communities, ecosystems). Increasingly sophisticated experiments (e.g., Oshida and Wright, 1976; Oshida, 1976) are able to document the deleterious effects of pollutant levels lower than those causing acute toxicity.

Mearns and Greene (1976) provided a regional assessment of the effects of five major wastewater outfalls in southern California on several benthic faunal characteristics: abundance, biomass, diversity, number of species and richness. The major effect noted was an increase in abundance and decrease in diversity, in proportion to the amount of wastewater discharged. Some evidence of large scale regional effects, possibly independent of the outfalls, was also found.

It should be noted that such findings are not necessarily equivalent to changes in the "quality" or "health" of the benthic community; this is a murky area subject to the point of view and interests of the evaluating party. Moreover, the usefulness of the diversity index has come into question, for a variety of reasons:

1. The values derived in a particular study are rarely comparable to those obtained in other studies due to differences in sampling effort and techniques.

2. The calculation of species diversity depends on accurate identification of many taxa, a task which is often difficult even for a team of specialists.

3. A sophisticated intensive and expensive monitoring program may be required to detect statistically significant changes in the diversity of a community.

4. Considerable ecological changes, including species composition, may occur without being reflected in the species diversity index. For example, if the abundant species suddenly become rare and the previously rare species become abundant, this will not be detected by a change in the diversity index if proportions remain the same. Furthermore, the index is relatively insensitive to changes in the abundance of rarer species. Changes in the numbers of top-level predators or important prey may have significant ecological effects, but may not be detected by changes in the diversity index.

5. There are theoretical reasons for questioning the usefulness of the diversity index as an environmental tool. Goodman, in a recent (1975) review of the relationship between diversity and stability, pointed out that a) "[The] Shannon-Weaver diversity is a dubious index. The biological meaning of what it represents is unclear; and there are no available criteria for precisely measuring community diversity under natural conditions"; b) Empirical studies and computer simulation models actually suggest that more diverse ecosystems are less stable, if stability means numerical constancy of individual species; c) "From a practical standpoint, the diversity-stability hypothesis is not really necessary; even if the hypothesis is completely false, it remains logically possible -- and, on the best evidence, very likely -- that the disruption of the patterns of evolved interaction in natural communities will have untoward, and occasionally catastrophic, consequences".

It is concluded that the outfall has affected the benthic community by changes in species composition and increasing biomass. The progression of these changes was altered by a depression of biological activity during the period of sludge disposal through the outfall. Appendix provides further information on this subject from a recent SCCWRP report to the EPA.

Epibenthic Fauna. Very little recent information has been available on the fish and epibenthic invertebrate fauna off the Point Loma waste discharge area; this is particularly true beyond the kelp forests of this region. Voglin (1975) reported the results of a one-day trawl survey (February 12, 1975) organized to 1) provide specimens of fish for analysis of trace elements and chlorinated hydrocarbons and 2) determine the composition of demersal fauna between 61 and 137 meters, a depth range comparable to depths sampled off Los Angeles and Orange Counties by SCCWRP (1973). Data on fish and invertebrate catch statistics were reported; chemical analysis data were expected to be reported later. One thousand eighty-four fishes representing 32 species and 14 families were taken in 8 hauls (1 per station). Details of the catch statistics, location and analysis are not presented here but are found in Voglin's report. No evidence of fin erosion or tumors was noted.

The number of invertebrates was not particularly high compared to other surveys in southern California, although the number of species was moderately high. A total number of 4,123 specimens representing 60 species was collected. Echinodermata, Mollusca, Arthropoda, and Annelida contributed to most of the diversity. Common and abundant species were *Lytechinus anamesus* (sea urchin), Sicyonia ingentis (ridgeback prawn), *Astropecten verrilli* (sand star), and *Parastichopus californicus* (sea cucumber). These species appear to indicate a generally normal benthic environment.

The large number of species present at Station 8 was in large part due to the many pieces of metal and plastic which contained many of these animals. Excluding Station 8, the number of species found in Point Loma ranges from 8 to 11.

Recently (1977), 60-meter bottom trawls in the San Diego area, including stations near the border, have been conducted by SCCWRP (Brad Meyers, SCCWRP, pers. comm.). A Willis otter trawl with a 24-foot mouth was used. Three grabs (0.1 m^2 Van Veen) were made at each station. Two were sorted for infauna on 2.5, 1.0 and 0.5 mm screens; the third grab sample was analyzed for chlorinated hydrocarbons, heavy metals, volatile solids, and grain size. These data have not been analyzed yet but will eventually be available from SCCWRP.

Kelp Beds. The Point Loma outfall lies about a mile seaward of a large kelp bed, at a depth of 130 feet below the bed. Like most kelp beds, this one harbors an abundant and diverse flora and fauna (Turner, et al., 1968). The bed has been studied by North (1965), who has also reviewed the biology of giant kelp and the ecology of kelp beds (1971).

Several factors, alone or in combination, can limit kelp distribution. Water temperature probably limits its north-south range; it cannot survive prolonged temperatures over 26°C. The inshore limit seems to be set by wave action and substrate conditions. On exposed coasts, giant kelp prefers rocky bottoms, perhaps because young stipes cannot tolerate burial by sediments. Offshore limits seem to depend on light penetration and turbidity. Other limiting factors include grazing (sea urchins are major predators), self-shading, encrusting growths, displacement by other bottom plants, and "black rot" which appears to be due to elevated water temperatures (Scotten, 1971).

The Point Loma kelp bed began to deteriorate seriously in the 1940's and by 1960 was virtually annihilated. Recovery began in the mid-1960's and the bed was restored within a few years to its present size of roughly one-third the maximum recorded area (see Figure II-29 and Table II-15). Those regions nearest sources of discharged wastes (the City of San Diego outfall in San Diego Bay) were affected first, and deterioration proceeded in both directions outward from the initial area. The relationship of discharged wastes to kelp deterioration during this time is complicated by massive dredging operations in San Diego and Mission Bays. The Point Loma kelp bed was observed to recede from Mission Bay in a southerly direction and from San Diego in a northerly direction coincident with the beginning of large scale dredging operations in Mission Bay after World War II.

This widespread loss of an economically valuable resource stimulated research into its causes, including a 5-year program of research sponsored by the State Water Pollution Control Board and conducted by the UC Institute of Marine Resources. The final report (State Water Quality Control Board, 1964) notes that "because of the permanency of the losses, and in view of the initial disappearances occurring in those regions nearest the outfalls, with subsequent losses tending to progress away therefrom, there is a firm basis for suspecting that an adverse influence has been exerted on the kelp zones at Palos Verdes and southern Point Loma by discharged wastes .... Of the possible adverse mechanisms investigated, toxic effects, sedimentation, and disease or deleterious action by microorganisms were found to be less likely than benthic grazing with possible complicating effects arising from changes in water clarity."

Sea urchins were found to be the chief grazers, often occurring in such densities as to prevent the re-establishment of kelp in denuded areas such as southern Point Loma. Despite the absence of benthic algae, large populations of urchins persist, suggesting that suspended detritus on organic-enriched sediments resulting from discharged wastes or other sources are providing sufficient nutrition even in the absence of macro-algae. This hypothesis is supported by the persistence of kelp beds immediately adjacent to the Santa Barbara outfall; in this area sea urchins are rare and thus grazing pressure on kelp beds is minimal. Similarly, the presence of abundant

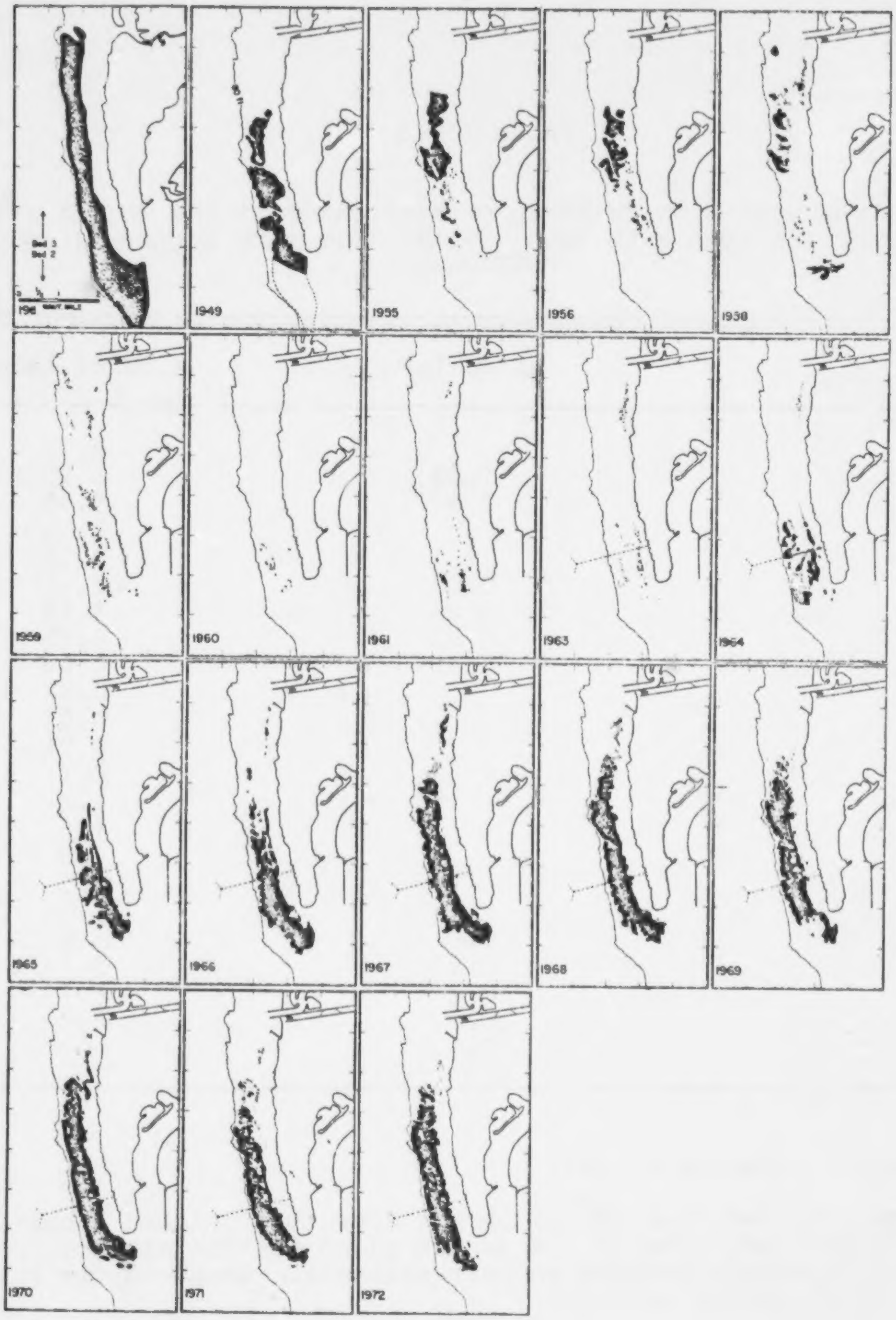


FIGURE II-29. HISTORICAL CHARTS OF THE POINT LOMA KELP BED (shown as black).

(1963 to 1966 from oblique photos courtesy Kelco Company. Years 1963 to 1972 represent fall conditions.)

Source: 1972-3 Ann. Rep., Kelp Habitat Improvement Project

Table II-15

HISTORICAL VARIATION IN AREAS OF KELP CANOPIES FOR THE LA JOLLA AND THE POINT LOMA KELP BEDS (VALUES REPRESENT SQUARE MILES OF COVERAGE)

Year	La Jolla	Point Loma
1857		5.95
1911	1.89	5.95
1934	2.6	3.65
1941	2.5	2.64[1]
1942		3.49[1]
1949	0.58	<2.11[2]
1955	0.77	1.18
1956	0.47	0.78
1958	0.31	0.61
1959		0.24
1960		0.03
1961		0.01
1963		0.1
1964		1.2
1965		1.6
1966		2.0
1967		3.5
1968		3.0
1969	0.2	3.2
1970	0.2	3.1
1971	0.3	2.1
1972	0.5	2.2
1973	0.6	

[1] Wohnus, unpublished data

[2] Area computed from aerial photographs that omitted a portion of the bed. The 1911 area was added for the missing portion, probably causing an over-estimate. Consequently the "less than" symbol was used.

Source: 1972-3 Ann. Rep., Kelp Habitat Improvement Project.

seaweed stands in shallow water (down to 25 feet at Point Loma) may result from sufficient light penetration to maintain plant productivity combined with enough wave surge to make the shallow environment unfavorable for grazing by urchins.

North (1965) reported the results of a one-year study of the kelp bed of southern Point Loma. Plants were in prime condition but sustained considerable damage due to grazing by sea urchins and canopy crustaceans. None of the parameters measured showed gradients related to distance from the outfall.

Plankton. Between 1956-60, the Allen Hancock Foundation studied the micro-plankton (Resig, 1961), and the benthic mollusks (Jones, 1961), polychaetes (Hartman, 1961), and communities (Barnard and Jones, 1961) of the southern California shelf. The Southern California Coastal Water Research Project studies (1973) have further described the plankton, benthic invertebrate, and coastal fish of the same area. Both studies considered the effects of wastewater discharges.

The plankton species have not been enumerated authoritatively. All species recorded by Resig exhibit strong population fluctuations. In the San Diego region, surface concentrations of cells varied between zero and greater than 20,000 cells/liter; the two vertical sections depicted show subsurface variations from zero to 5,000-10,000 cells/liter. No seasonal pattern was apparent. Other areas along the coast showed a similar range of cell concentrations in the surface waters; in the subsurface waters, the San Pedro waters showed concentrations of 10,000-125,000 cells/liter in one survey.

The Southern California Coastal Water Research Project studies (1973) compared phytoplankton productivity in Point Loma effluent (0.5 percent concentration), seawater, nutrient-enriched seawater, and nutrient and effluent-enriched seawater. The results showed that nitrogen is the limiting nutrient, but that the limits of other nutrients are quickly reached when nitrogen is added. They showed Point Loma effluent to be "a complete and well-balanced medium for algal growth" (Since the survey was conducted over a 4-day period, it would not show any long-term effects of trace toxicants.) Even so, field surveys suggested that no significant enhancement of phytoplankton occurred near the outfall (as compared with control samples taken near La Jolla).

Chen (1970) reviewed plankton sample data collected at Point Loma during 1962-67. Although the relative abundance of various genera fluctuated, no major shifts occurred among them.

Martin and Broenkow (1975) have measured cadmium concentrations in plankton at various points in the northeast Pacific. Samples taken off San Diego contained low concentrations, compared to the rest of the southern California bight, which in turn was low compared to the area off Baja California.

Fish and Marine Mammals. No general survey of the fishes present in San Diego coastal waters has been located. North (1971) and Quast (1971) have listed the fishes inhabiting kelp beds and rocky inshore areas. Recreational and commercial fish landings have been recorded for the San Diego area (California Department of Fish and Game, 1976, 1973a, 1965), and southern California (MacCall, et al., 1976). Many cosmopolitan species, including Pacific bonito, swordfish, tuna (several species), skipjack and yellowtail, occur in the deeper waters (MacCall, 1976, California Department of Fish and Game, 1961). Several marine mammals have been seen in the area, including seals, sea lions, porpoises, and several rare and endangered species of whales (U. S. Fish and Wildlife Service, 1976; Lowry & Associates, 1976).

Allen and Voglin (1976) analyzed trawl samples taken near Point Loma (1975) only and nine other southern California areas (mostly late 1960s and early 1970s). The Point Loma samples were average in (Brillouin) diversity, but below average in numbers of specimens, numbers of species, and total biomass. However, the number of samples taken off Point Loma was quite small compared to most other locations. More recent surveys are discussed under "Epibenthic Fauna".

A number of physical anomalies have been noted in fish from southern California waters, including bone deformities, asymmetries, fin erosion (Table II-16) and tumors. These have been studied by SCCWRP in some detail. The exact cause of these tumors, most often encountered in the Dover sole (Microstomus pacificus), is unclear. They may be due to viruses or environmental carcinogens. The relationship of discharged wastes to the etiology of this disease is still unknown. Afflicted fishes are found at points distant from waste outfalls as well as at points nearby (Sherwood and Mearns, 1976) Figure II-30, but the meaning of this observation is obscured by fish migrations and transport of compounds deriving from waste discharges. The occurrence of tumor-bearing Dover sole seems to be greater from outfall areas than from control areas, but this trend remains to be verified by further study (Sherwood and Mearns, 1975). Fin erosion disease afflicted 35 of the 121 species taken in a study by SCCWRP (1973), most frequently the Dover sole and the white croaker (Genyonemus lineatus). The incidence of

Table II-16

PREVALENCE OF FIN EROSION IN DOVER SOLE COLLECTED OFF SOUTHERN CALIFORNIA, 1972-1975.

	Santa Monica Bay	Palos Verdes Shelf	San Pedro Bay	Dana Point	Point Loma	Santa Catalina Island
No. of Samples	60	144	73	78	8	28
No. of Samples with Dover sole	39	106	44	45	7	16
Sampling Period	1972-73	1972-73	1972-73	1972-74	1975	1972-74
No. of Dover sole	516	14,277	3,842	881	64	135
No. with eroded fins	9	5,594	88	6	0	0
Percent with eroded fins	1.7	39	2.3	0.68	0	0

Source: Coastal Water Research Project, 1975 Ann. Rep.

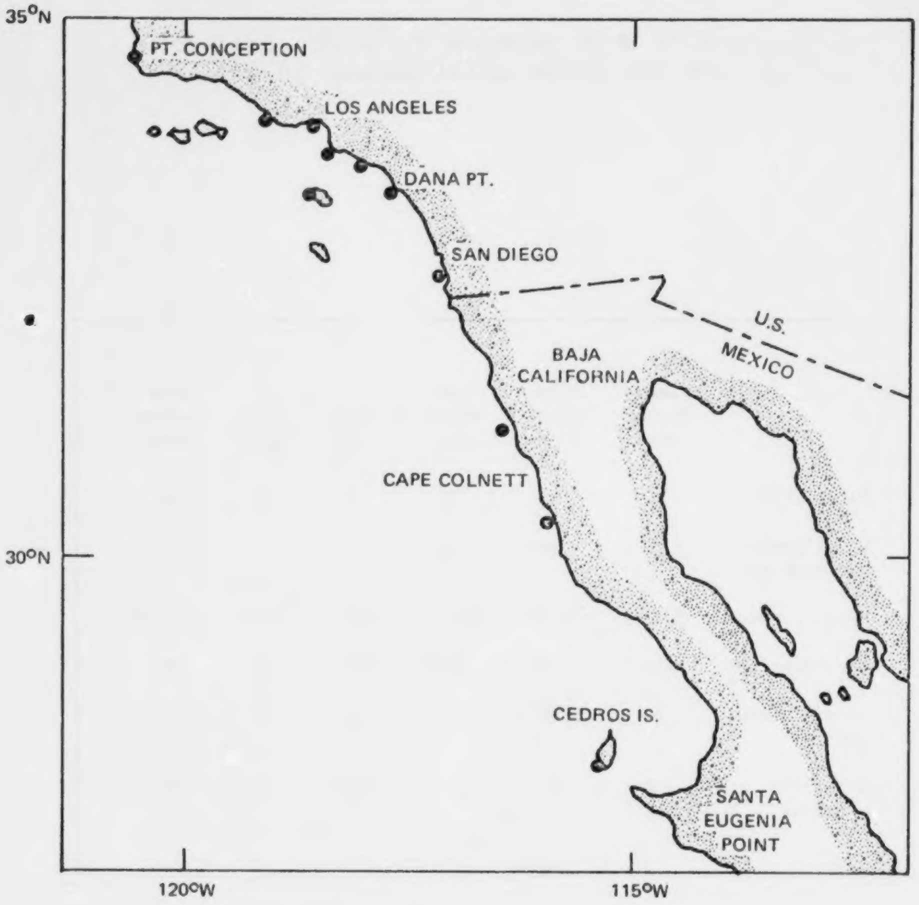


FIGURE II-30. COLLECTION LOCATIONS FOR DOVER SOLE WITH SKIN TUMORS

Source: SCCWRP 1975 Ann. Rep.

fin erosion observed varies from none at Point Loma to 39 percent on the Palos Verdes Shelf (Table II-16). Subsequent research has suggested that fin erosion may be linked to sediment conditions and perhaps chlorinated hydrocarbon uptake (Sherwood, 1976; Sherwood and McCain, 1976). Bone deformities and asymmetries were tabulated for collections of three kinds of fish (barred sand bass (*Paralabrax nebulifer*) (Valentine, 1969), California grunion (*Leuresthes teneis*), and barred surf perch (*Amphisticus argenteus*) taken from museums and in the field between San Simeon, California and Baja California Sur. For all three species, deformities were most frequent off the southern California coast, but causative factors could not be identified.

All five of the species mentioned above occur in the study area (Allen and Mearns, 1976; Southern California Coastal Water Research Project, 1976; California Department of Fish and Game, 1976), and one (the barred sand bass) has been sighted in the immediate vicinity of the outfall (Turner, et al., 1968). No one has assessed in detail the effects of Point Loma effluent, if any, on local fishes; Allen and Voglin (1976) reported that trawl surveys do not reveal major effects of discharges on demersal fish invertebrate populations.

Intertidal Habitat Zone. The intertidal flora of Point La Jolla have been surveyed along several transects by Dawson (1961) and Turner, et al. (1965, 1968) have surveyed the flora and fauna of rocky transects on Point Loma. No rigorous survey of sandy beach fauna has been made, but Jaeger and Smith (1971) mention the most prominent species.

Sandy and rocky intertidal communities show a characteristic longshore zonation according to height above the low water mark. This is strongly modified by wave action. Sandy beach fauna are further influenced by sand grain size and interstitial detrital contents, while rock flora and fauna are affected by exposure to desiccation, light, and burial by shifting sand (Dawson, 1961).

The major danger posed by the Point Loma outfall to intertidal communities is contamination by trace toxicants. Accordingly, much effort has been devoted to selecting an appropriate intertidal indicator organism. The mussels, *Mytilus californianus* and *Mytilus edulis*, have been used most often. Investigators have also used the gooseneck barnacle (*Pollicipes polymerus*), which coexists with the mussels, starfish (*Pisaster* spp.) which preys on all three; and the sand crab (*Emerita analoga stimpsoni*), which lives in sandy beaches. These have been collected all along the California coast and analyzed for DDT, DDE, DDD, PCBs, benzo(a)pyrene, and various heavy metals.

Burnett (1971) has sampled total DDT, DDE, and DDD content for the whole body of sand crabs collected between San Francisco Bay and Ensenada, Mexico. Southern California Coastal Water Research Project (1973) reported total DDT concentrations in the soft tissue of mussels (*M. californianus*) taken between Big Sur and Punta Banda, Mexico, and on seven Channel Islands. Both studies yielded the same conclusion: concentrations were two to four orders of magnitude greater near Whites Point outfall, the discharge point for the world's major DDT producer (Montrose Chemical Company), than at points distant from it. Point Loma concentrations were typical of the distant sites.

For the PCB Arochlor, Point Loma samples (*Mytilus californianus*, whole soft tissues) were one-half to one-fourth those of samples taken near the Whites Point outfall, but about ten times those of outlying sites (Southern California Water Research Project, 1973).

Benzo(a)pyrene, a carcinogen, was not present in measurable amounts (0.1 μg/kg) in samples of mussels taken at La Jolla or San Diego. Within the range of sampling (Bodega Head-San Diego Bay, plus five Channel Islands) maximum amounts occurred at Seal Beach (2.3-8.2 μg/kg) and Oceanside (2.3 μg/kg) (Dunn and Young, 1976).

Southern California Coastal Water Research Project (1973) reports data on concentrations of 25 heavy metals in the digestive glands of *M. californianus* taken between Gaviota and Point Loma, and on six Channel Islands. Unlike the chlorinated hydrocarbons, none of the heavy metals showed any particular correlation with wastewater outfalls. The Point Loma samples had the highest mean values for copper and zinc, but were below the coastal average for lead, the only metals for which data on each site were given.

Eganhouse and Young (1976) sampled mercury concentrations in the digestive glands of *M. californianus* taken between Point Sal and Point Loma, and on five Channel Islands. Point Loma specimens had the highest mean value (0.017 μg/kg). This was tentatively linked to wastewater discharges or harbor activities.

Bays and Estuaries

On the coast of the study area, there are three coastal lagoons and two bays. These have been described generally in reports by the California Department of Fish and Game (1969, 1973a). and the California Native Plant Society (Henrickson, 1976). The coastline as a whole and its planned uses have been described in the California Coastal Plan

(California Coastal Zone Commission, 1975). In addition, separate reports have been published on Los Penasquitos Lagoon (California Department of Fish and Game, 1974), the Tia Juana River estuary (U. S. Army Corps of Engineers, 1974), and San Diego Bay (South San Diego Bay Environmental Study Committee Report, 1971; California Department of Fish and Game, 1973b).

The major threats to the water quality and habitats within these areas stem from shoreline development, rather than the ocean discharges of treated effluent. With the possible exception of long-term bioaccumulative toxicants such as chlorinated hydrocarbons, there is little interaction between effluent discharges and estuarine ecosystems.

San Dieguito Lagoon. San Dieguito Lagoon, partially within the City of Del Mar, is the estuary of San Dieguito River. It has been largely filled and is now the site of the Del Mar Race Track and the County Fairgrounds. The lagoon presently consists of a ponded area in the lower part (of the original lagoon) east of the highway and two channels reaching eastward, totalling about 95 acres of marsh and 60 acres of sheltered waters. These are closed off from the ocean and are themselves subdivided by dikes and bridges.

A large volume of secondary effluent was discharged by the City of Del Mar into an oxidation pond in the upper lagoon and thence into the lagoon itself. This operation has been stopped and the City of Del Mar disposes of its effluent into the San Diego Metropolitan Sewerage System.

The upper lagoon consists of a dry marsh which gives way to a sage-covered plain now designated an agricultural preserve. Single-family subdivisions cover most of the land on the north and south sides of the lagoon to the west of the freeway, while development is fairly sparse to the east. The Coastal Plan (California Coastal Zone Commission, 1975) has recommended that the remaining habitat be preserved and restored.

Los Penasquitos Lagoon. The Los Penasquitos Lagoon, 17 miles north of San Diego, contains about 385 acres of marsh and sheltered water, about 185 acres of which are flooded on a regular basis by tidal waters. A sand bar forms across the mouth of the lagoon during the summer, but periodically is opened by bulldozer. Until 1972 the lagoon received some 1.5 million gallons of secondary sewage effluent each day, which caused severe eutrophication (Henrickson, 1976). Most of the lagoon is publicly owned. The San Diego Gas and Electric Company owns most of the remainder.

The lagoon shelters a varied and abundant community of vegetation, fish, shellfish and birds, including several rare or endangered species. It is a prime feeding and resting area for migratory waterfowl, and a spawning and nursery grounds for estuarine and inshore fish; thus, it provides an excellent research and educational site for local scientists. It is also used for picnicking, fishing, boating, and recreation.

The primary water quality problem of the lagoon is inadequate tidal flushing and circulation, due to the constricted (and occasionally blocked) lagoon entrance. Other problems are posed by increased runoff and sedimentation due to development of the surrounding hills; pollutants borne by the runoff; and damage from past mosquito abatement programs. Possible future problems include thermal discharges from a plant proposed by the San Diego Gas and Electric Company; and proposed street realignments within the lagoon (California and Fish and Game, 1974).

Mission Bay. Mission Bay once contained some 2,400 acres of marsh and shallow bay. It had large eel grass beds and was a major stopover and winterground for black brant (Henrickson, 1976). In the early 1960's, the entire bay was dredged and turned into a commercial development and park. Fiesta Island, in the middle of the bay, is the location of San Diego's sludge dewatering facilities. Only 21 acres of marsh remain.

Water quality in Mission Bay is generally quite good. No sewage or industrial waste discharges enter the bay from shore sources. Trash and oil spills are minor problems. Mission Bay's principal water quality problem is chronic phytoplankton blooms in inner arms of the bay. This phenomenon results in localized coloration and turbidity, froth on inland beaches and dissolved oxygen fluctuations. While the causes of red tides are not yet fully understood, the problem has been linked to nutrients borne by surface runoff, poor circulation, and elevated summer temperatures (El Wardani, 1977).

San Diego Bay. San Diego Bay is a crescent-shaped body of water about 14 miles long and 2-1/2 miles across at its widest point. Maximum depth exceeds 60 feet, but aside from dredged channels, most of the bay is less than 40 feet deep. The deep entrance and extensive shelter anchorage qualify the bay as an outstanding harbor. The bay is classified as an estuarine system; however, fresh water input has been greatly reduced by dam construction, extensive use of groundwaters and prolonged drought conditions. The sediments in the harbor area vary from coarse sand to organic silt. Sedimentation due to alluvial contributions is no longer considered significant.

Circulation of bay waters depends on tidal flushing, which is sluggish in the south end of the bay, but strong enough in the northern and central portion of the bay to normally provide waters of fairly high quality.

Near the bay entrance the mean tidal range is 3.7 feet. The range between mean higher high water (MHHW) and mean lower low water (MLLW) is 5.3 feet. The extreme range of tides within the bay is 9.5 feet. The bay has a tidal prism of about one-third of its volume. The tidal currents in the bay are strongest in the entrance and in the northern part of the bay. Surface velocities in the north bay range up to 2.9 knots on the ebb tide and 2.2 knots on the flood tide.

San Diego Bay at one time contained about 2,450 acres of salt marsh and 1,200 acres of mudflats. The marsh has been reduced to 360 acres, and only about 600 acres of mudflats remain; and in addition, there has been a 75 percent reduction in sheltered water habitat to a current 11,700 acres. The south end of the bay has been diked into a series of salt production ponds. The area also contains some marshland habitat near the mouth of the Sweetwater River. This marsh habitat is currently privately owned, but negotiations are underway to have the Army Corps of Engineers acquire the marshland habitats to ensure against their development after completion of flood control projects on Sweetwater River. The salt production ponds are on public land but are leased until 1984. Although these salt evaporation ponds are not natural habitats, they support large bird populations (Henrickson, 1976).

San Diego Bay water quality has improved greatly since 1963, when discharge of sewage into the bay was stopped and the metropolitan sewerage system became operational. The bay now meets State Health Department standards for water contact activities everywhere except in the immediate area of vessels still discharging raw sewage. The remaining water quality problems in the bay are caused by: trash and raw sewage discharges from vessels in the harbor; oil spills, which have become less frequent; urban runoff, which increases the loads of trash, turbidity, and bacteria; shipyard wastes, which contain high concentrations of several heavy metals (see Waste Sources); and harbor sediments and dredge spoils, which can contain high concentrations of heavy metals and chlorinated hydrocarbons (El Wardani, 1977; Southern California Coastal Water Research Project, 1973; California Department of Fish and Game, 1973b).

Tia Juana Lagoon. Tia Juana Lagoon, southernmost of the lagoons, is the estuary of the Tia Juana River, which adjoins the Mexican border on its southern edge. It is the only one of San Diego County's lagoons not seriously altered by man. There are no roads or railroads crossing it, and no structures within its marsh area. The lagoon is flushed naturally by the ocean and supports a varied population of fish, molluscs and wildlife. The California Coastal Zone Commission (1975) has called it "one of the state's most valuable areas", and recommended its preservation.

The floodplain area to the east is mostly in agricultural use, though these lands have suffered problems of drought and salt intrusion in recent years. In the western part, two naval installations are located on the edges of the lagoon: Ream Field on the north and Border Field on the south. Five hundred acres of the Border Field facility were transferred to the state for development as an international park on the United States-Mexican border.

While also subject to sand blockage, the Tia Juana River estuary is not as vulnerable as Penasquitos Lagoon because of its much larger tidal prism. The estuary was closed in the past, causing great loss of marine life, and has had to be artificially opened. Present water quality problems are related to heavy urbanization in the Mexican portion of the watershed. Coliform concentrations have been shown to increase when the estuary receives storm runoff from nearby Playas de Tijuana and Goat Canyon (U. S. Army Corps of Engineers, 1974; El Wardani, 1976).

Regional Waste Discharges, Receiving Water Quality and Sediment Quality

Regional Waste Discharges. The major sources of pollutant inputs to the southern California bight are municipal wastewater discharges, industrial discharges, surface runoff, ocean vessels and harbor and shipyard activities, ocean dumping, and aerial fallout. Table II-17 gives the most recent available estimates of the amounts contributed by these sources to various pollutant loads. Minor sources, more local in nature, include mosquito abatement activities, thermal and saline effluents, dredging and channeling activities, and physical alterations of the shoreline.

Table II-17 shows that municipal wastewater discharges were the major sources of 21 of the 32 pollutants listed. Exceptions included silt, nitrate-nitrogen, and iron, introduced mainly by surface runoff; mercury, lead, zinc and

Table II-17

SOUTHERN CALIFORNIA BIGHT
SOURCES AND MASS CONTRIBUTIONS OF POLLUTANTS** (Metric Tons Per Year)

	DISCRETE SOURCES			DIFFUSE SOURCES			
CONSTITUENTS	Municipal Wastewaters	Surface Runoff	Industrial Waste	Ocean Vessels	Ocean Dumping	Aerial Fallout	Total
Silt	-	274,000	-	-	-	-	274,000
Total Suspended Solids	278,000	-	16,000	-	-	-	294,000
Volatile Suspended Solids	179,000	-	-	-	-	-	179,000
5-day Bio. Oxygen Demand	291,000	-	6,000	-	-	-	297,000
Chemical Oxygen Demand	675,000	29,000	78,000	-	-	-	782,000
Oil and Grease	65,000	4,400	2,200	-	-	-	71,600
Dissolved Silica (SiO_2)	33,000	2,800	-	-	-	-	35,800
Nitrate Nitrogen	530	980	-	-	-	-	1,510
Ammonia Nitrogen	59,400	440	9,500	-	-	-	69,340
Organic Nitrogen	24,800	1,090	-	-	-	-	25,890
Total Nitrogen	85,400	2,510	10,000	-	-	-	97,910
Phosphate Phosphorous	13,300	410	-	-	-	-	13,710
Detergent (MBAS)	7,600	66	-	-	-	-	7,666
Cyanide (CN)	210	11	-	-	-	-	221
Phenols	1,730	269	43	-	-	-	2,042
Heat (10^9kwh/yr)	-	-	94	-	-	-	94
Silver	15	1.1	-	-	1.5	-	18
Arsenic	-	-	-	1.5	-	-	2
Cadmium	54	(2)	-	0.1	<14	-	70
Cobalt	3.0	5.3	-	-	14	-	22
Chromium	(640)	(50)	-	1.0	<28	-	719
Copper	(570)	(36)	-	(390)	<28	400	1,424
Mercury	(3)	(0.2)	-	(4)	<2	8	17
Nickel	313	17	-	-	28	40	398
Lead	(210)	(180)	-	(10)	<28	3,400	3,828
Zinc	1,680	101	-	164	56	2,200	4,201
Iron	6,000	26,000	-	-	280	40	32,320
Manganese	102	183	-	-	28	480	793
Total DDT	(5)*	(0.2)	0.02	(0.001)	14	(1)	
Total PCB	5.4	(.8)	0.25	-	-	(1.8)	

* DDT was ~100 MT in 1960, 19 MT in 1971: PCB was 10 MT in 1971.

** Data from SCCWRP 1973, revised 1974 for metals and chlorinated hydrocarbons.
A metric ton is 2,204 pounds, or 1.1 Standard short tons.

Source: El Wardani, 1977.

manganese, mostly from aerial fallout; cobalt and DDT, mainly from ocean dumping; and thermal effluents, which are industrial discharges.

Municipal Wastewater Discharges. The Point Loma outfall is the only municipal wastewater outfall in the study area discharging primary treated effluent to the ocean. Table II-18 shows that within the San Diego Basin Point Loma is by far the largest outfall, with 90 percent of the total effluent discharged to the ocean. Table II-19 shows that within the San Diego Basin Point Loma is by far the largest outfall, with all of the primary effluent and 90 percent of the total effluent discharged to the ocean.

The characteristics of San Diego's effluent discharges are described in a subsequent portion of this chapter.

Industrial Discharges. Most industrial dischargers have been required to cease discharging to the ocean. Nevertheless, San Diego Bay still receives cooling water discharges, and saline effluents from the salt ponds in the south bay (see Bays and Estuaries). Apparently some cooling water is still discharged to the ocean (California State Water Quality Control Board, Regional Water Quality Control Board, San Diego Region, 1975). Table II-20 lists the major cooling water dischargers in southern California as of 1970-71.

Industrial discharges to the City of San Diego treatment system have been reviewed by Culp Wesner Culp Associates (Lowry & Associates, 1976).

Surface Runoff. The State Water Quality Control Board, San Diego Region (1975) has calculated annual quantities of urban and nonurban surface runoff, and their loads of BOD, TDS, total nitrogen and phosphorus. According to their study, problems exist in all inland hydrographic units, but none is shown for the ocean.

Aerial Fallout As shown in Table II-21, aerial fallout is the major source of all inland inputs of mercury, lead, zinc and manganese into the southern California bight. It is also a substantial source of copper and PCB's. No estimates exist for the study area in particular. No data on aerial fallout to the study area in particular has been reported.

Advective Transport. As shown in Table II-21, the California current contributes the major part of all inputs of silver, cadmium, cobalt, chromium, copper, mercury, nickel, zinc, lead, iron, manganese, DDT and PCB's to the

Table II-18

SAN DIEGO BASIN MUNICIPAL WASTEWATER TREATMENT PLANTS DISCHARGING TO THE PACIFIC OCEAN, 1977.

Plants and Member Agencies	Reported flows (mgd) Jan - March 1977*
San Diego Metropolitan (Primary Treatment)	
Chula Vista	4.76
Coronado	1.84
Del Mar	0.44
El Cajon	7.41
Imperial Beach	2.88
La Mesa	4.27
National City	3.58
Lakeside-Alpine	1.72
Lemon Grove	1.64
Montgomery	2.58
Rolando	0.23
Spring Valley	5.89
Padre Dam ***	2.96
Pomerado	2.43
San Diego (inc Navy plus regional development)	67.86
Tijuana **	4.45
Otay MWD **	0
Total	114.9
Encina Plant (County of San Diego) (Secondary treatment)	
Vista	3.34
Carlsbad	2.71
Buena	0.44
San Marcos	2.01
Leucadia	1.56
Encinitas	0.55
Total	10.61
San Elijo Plant (County of San Diego) (Secondary treatment)	
Cardiff	1.03
Solana	1.04
Total	2.07

* Corrected for Inter-agency transfers between City of San Diego and member agencies.

** Non-member flows - Otay 0.30 added to Spring Valley.

*** Contractual rights changed during this quarter.

Source: CPO, 1977f.

Table II-19

MUNICIPAL WASTEWATERS DISCHARGED TO SOUTHERN CALIFORNIA COASTAL WATERS, 1975

Discharger	Agency	Flow, (mgd)	Nature of Effluent	% of Total Flow
Joint Water Pollution Control Plant (JWPCP)	Los Angeles County Sanitation Districts	339	Primary	32.4
		1.7	Digested Sludge Centrate	0.16
Hyperion Plant	City of Los Angeles Bureau of Sanitation	249	Primary	23.8
		100	Secondary	9.56
		2.3	Plant Sludge	0.22
Orange County Plants	Orange County Sanitation Districts	165.2	Primary	15.8
		10	Secondary	0.96
Pt. Loma Plant	City of San Diego	109	Primary	10.4
Oxnard Plant	City of Oxnard	9.51	Primary	0.91
Other (about 20)	Various	40	Primary	3.8
		20	Secondary	1.9
Total		1,045.7		100

Source: SCCWRP Ann. Rep. 1976

Table II-20

THERMAL DISCHARGES AT POWER GENERATING STATIONS IN THE SOUTHERN CALIFORNIA COASTAL AREA AS OF 1970-71[a]

Fuel STATION-Location	Plant Operation			Estimated Waste Heat to Cooling Water[d]				Estimated Cooling Water Flow[d]		
	1	2	3	4	5	6 Plant Waste Heat, H		7	8 Cooling Water Flow, R	
	Capacity, MW_e (mw)	Load Factor, F (%)	Overall Efficiency, E (%)	Waste Heat per unit of Electrical Output, Q	Waste Heat to Cooling Water per Unit Output, Q_w	6A Maximum, H_{max} (10^6 kw)	6B Average, H_{avg} (10^6 kw)	Normal Average Temp Rise, T (°C)	8A Maximum, R_{max} (10^6 cu m/day)	8B Annual, R_{avg} (10^8cu m/year
FOSSIL-FUEL TYPE										
L.A. Dept. of Water and Power										
P1 Harbor, Wilmington	445	14	25	3.00	2.55	1.1	0.2	11	2.1	1.1
P2 Haynes, Seal Beach	1,625	60	36	1.78	1.51	2.5	1.5	10.5	4.8	10.5
P3 Scattergood, Playa del Rey	350	59	34	1.65	1.65	0.5	0.3	10	1.2	2.5
Subtotal	2,420					4.1	2.0		8.1	14.1
Southern California Edison Co.										
P4 Alamitos, Seal Beach	1,950	58	36	1.78	1.51	2.9	1.7	11	5.5	11.6
P5 El Segundo, El Segundo	1,020	50	35	1.86	1.58	1.6	0.8	12	2.7	5.0
P6 Huntington, Huntington Beach	990	65	35	1.86	1.58	1.6	1.0	12	2.8	6.5
P7 Long Beach, Long Beach[b]	210	20	25	3.00	2.55	0.5	0.1	10.5	1.0	0.8
P8 Mandalay, Oxnard	430	73	36	1.78	1.51	0.6	0.5	11	1.2	3.2
P9 Redondo, Redondo Beach	1,600	52	33	2.03	1.72	2.8	1.4	11	5.1	9.8
P10 Ormond, Ormond Beach	1,580	55	34	1.94	1.65	2.6	1.4	10.5	5.1	10.2
Subtotal	7,780					12.6	6.9		23.4	47.1
San Diego Gas and Electric Co.[b]										
P11 Encino, Carlsbad	345	55	34	1.94	1.55	0.5	0.3	10.5	1.1	2.2
P12 Silver Gate, San Diego Bay	235	55	34	1.94	1.65	0.4	0.2	7	1.1	2.2
P13 South Bay, San Diego Bay	530	55	34	1.94	1.65	0.9	0.5	7	2.5	5.0
P14 Station "B," San Diego Bay	95	55	34	1.94	1.65	0.2	0.1	7	0.5	0.9
Subtotal	1,205					2.0	1.1		5.2	10.3
Total, Fossil-Fuel Type	11,405					18.7	10.0			7.5
Weighted Mean[c]		55	34	1.94	1.65			10.5		
NUCLEAR										
P15 San Onofre, San Clemente	450	80	32	2.12	2.02	0.9	0.7	10	1.9	5.5
TOTAL	11,855					19.6	10.7		38.6	77.0

a. Station operating data provided by power companies, except as noted in Note b below.
b. Estimated values for the year 1971 .
c. All mean values are weighted by plant capacity.
d. Calculations:
   (i) Column (4): $Q = (1 - E)/E$
   (ii) Column (5): Assume 15% of heat wastage lost through stack for fossil-fuel-type plant; 5% for nuclear power plant.
   (iii) Column (6A): $H_{max} = (MW_e) \times (Q_w) \times 10^3$
   (iv) Column (6B): $H_{avg} = (H_{max}) \times F$
   (v) Column (8A): $R_{max} = (H_{max}) \times 20.7/(T)$
   (vi) Column (8B): $R_{avg} = (R_{max}) \times (F) \times 365$

Source: Southern California Coastal Water Research Project, 1973.

Table II-21

ESTIMATED TRACE CONSTITUENT MASS EMISSION RATES (M TONS/YR) FOR ALL SOURCES TO THE SOUTHERN CALIFORNIA BIGHT, 1971

Constituent	1 Wastewater Discharge	2 Surface Runoff	3 Vessel Coating*	4 Ocean Dumping	5 Rainfall on Bight	6 Sum of Col. 1 through 5	7 Advective Transport**	8 $\frac{\text{Col. 6}}{\text{Col. 7}}$ (%)	9 Total Sum of Col. 6 and 7	10 $\frac{\text{Col. 1}}{\text{Col. 9}}$ (%)
Silver	15	1		1.5		18	6,000	0.3	6,020	0.3
Cadmium	54	1	0.1	14		69	2,000	3.5	2,070	2.6
Cobalt	3	5		14		22	8,000	0.3	8,020	0.04
Chromium	649	25	1	28		703	4,000	17.5	4,700	13.8
Copper	567	18	386	28	400	1,399	60,000	2.3	61,400	0.9
Mercury	3	0.1	4	1.5	8	17	600	2.8	617	0.5
Nickel	313	17		28	40	398	140,000	0.3	140,400	0.2
Lead	211	90	10	28	1000	1,339	6,000	22.4	7,340	2.9
Zinc	1680	101	164	56	2200	4,201	200,000	2.1	204,200	0.8
Iron	6000	26,000		280	40	32,320	60,000	53.8	92,300	6.5
Manganese	102	183		28	480	793	40,000	2.0	40,800	0.3
Total DDT	19	0.1		14	2†	45	200	22.5	245	7.8
Total PCB	10	0.2	4	28	2†	44	200	22.0	244	4.1

*Including vessel antifouling paints, primers, and spent fuel residues.
**Estimated mass transport rates of California current.
†Estimated influx of dry fallout.

Source: Southern California Coastal Water Research Project, 1973.

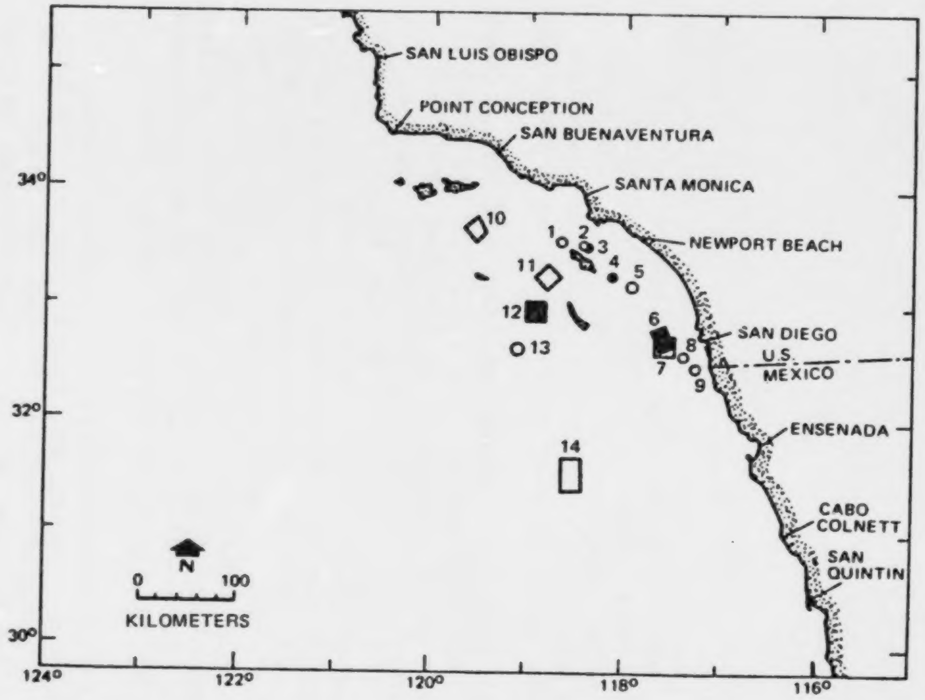
southern California bight. Much of this could be considered "natural background" loads; the remainder represents recent additions by terrestrial activities.

Ocean Dumping. Figure II-31 shows the major dumping sites for 1931-71 off the southern California coast. None of these sites is in the study area. Site 8, which is 15 kilometers offshore, received about 320,000 tons of filter cake (perlite and cellulose) in 1969-71. Site 7, about 32 kilometers west of Point Loma, received about 140 metric tons of sodium cyanide during 1960-67. Site 6, where military explosives have been dumped, is temporarily inactive (Southern California Coastal Water Research Project, 1973).

Ocean Vessels and Harbor and Shipyard Activities. In addition to trash and sewage, ocean-going vessels contribute lead to the sea by burning leaded fuel. Marine antifouling paints and primers, and anticorrosion coatings, also contributed trace pollutants (see Table II-22) (Southern California Coastal Water Research Project, 1973). These data pertain to the southern California bight as a whole; no data for the study area in particular have been reported.

Receiving Water Quality. Water quality off Point Loma has been monitored intermittently. In 1951-52, physical oceanographic studies were conducted at several proposed outfall discharge locations along the San Diego county coastline. During 1956-60, personnel of the Allan Hancock Foundation conducted studies of the physical and biological characteristics of the southern California shelf (Stevenson, 1961). In 1958-59, site-specific studies were undertaken as part of the outfall pre-design studies. In the past few years, the Southern California Coastal Water Research Project has undertaken a wide-ranging water quality research program in the southern California bight (Southern California Coastal Water Research Project, 1973, 1976).

In May 1962, 1-1/2 years before the outfall began operation, a monitoring program was instituted by the City of San Diego under a program devised by the San Diego Regional Water Quality Control Board. This program called for a predischarge environmental assessment of water quality and sediments in the vicinity of the proposed outfall, including a detailed taxonomic classification and enumeration of bottom organisms and free floating planktonic forms (see sections on "Sediment Quality" and "Marine Biology"). Samples were collected at seven stations located on the periphery of a two-mile square centered on the proposed diffuser wye, four control stations remote from the outfall site, a group of



Designated Ocean Dumping Sites in the Southern California Bight (Shaded Sites are **Active**).

Figure II-31

Source: Southern California Coastal Water Research Project, 1973.

Table II-22

TYPICAL TRACE CONSTITUENT COMPOSITION OF ANTIFOULING PAINTS AND PRIMERS

Type	Trace Constituent	Average Concentration (%)
Antifouling Paint	Copper	50
	Mercury	0.5*
	Arsenic	0.2**
	PCB	0.5†
Zinc Chromate Primer	Zinc	45
	Chromium	12
Red Lead Primer	Lead	25

*Assuming that mercury content of mercury paints is 5% and that mercury paints comprise 10% of total paint usage.

**Assuming that arsenic content of arsenic paints is 2% and that arsenic paints comprise 10% of total paint usage.

†Assuming that PCB content of paints is 5% and that paints containing PCB comprise 10% of total paint usage.

Source: Southern California Coastal Water Research Project, 1973.

so-called inshore stations situated just outside the surf zone, and a series of stations along the shoreline in areas that could potentially be affected by the outfall (see Figure II-32).

The original monitoring program involved collection of biweekly samples at three depths in the water column from 18 different locations. Bathythermal and light transmission data sufficient for profiles of the water column were periodically obtained at all stations. Shore stations were monitored for coliform bacteria at weekly intervals throughout the summer season, May through October, and biweekly otherwise.

This program, involving more than 450 observations or analytical determinations per cruise of all monitoring locations, was maintained throughout the predischarge period of about 15 months and continued more or less unmodified in scope through 1966. The accumulated data have been subject periodically to review by the City of San Diego, the San Diego Regional Water Quality Control Board and their respective consultants.

These observations led to a number of modifications in the monitoring program. In 1967, the San Diego Board reduced the required frequency of water sampling from biweekly to monthly. The rather comprehensive list of analyses of water samples was also scaled down to the four most pertinent parameters, visual evidence of floatables, direct measurement of temperature, transparency and coliform count. In compensation, seven more stations were added to the list, A-8 through A-14, giving better areal coverage of the diffusion zone close to the wye. Extant data indicate that benthic sediment characteristics provide the best index to zone of effect for the outfall, consequently, this index should be considered in any future monitoring program.

In addition to monitoring of the receiving water and the marine environment, the City of San Diego has maintained detailed records of the quality of the effluent discharged through the outfall since it went into operation in August 1963. The analyses currently being performed and reported at semi-monthly intervals include those for BOD, total solids, grease, suspended solids, volatile solids, pH, alkalinity, detergents, chlorides, calcium, magnesium ammonia, phenols, turbidity, settleable solids, radioactivity, heavy metals, and pesticide residues. Effluent quality is discussed in a separate section "The Existing Point Loma Discharge".

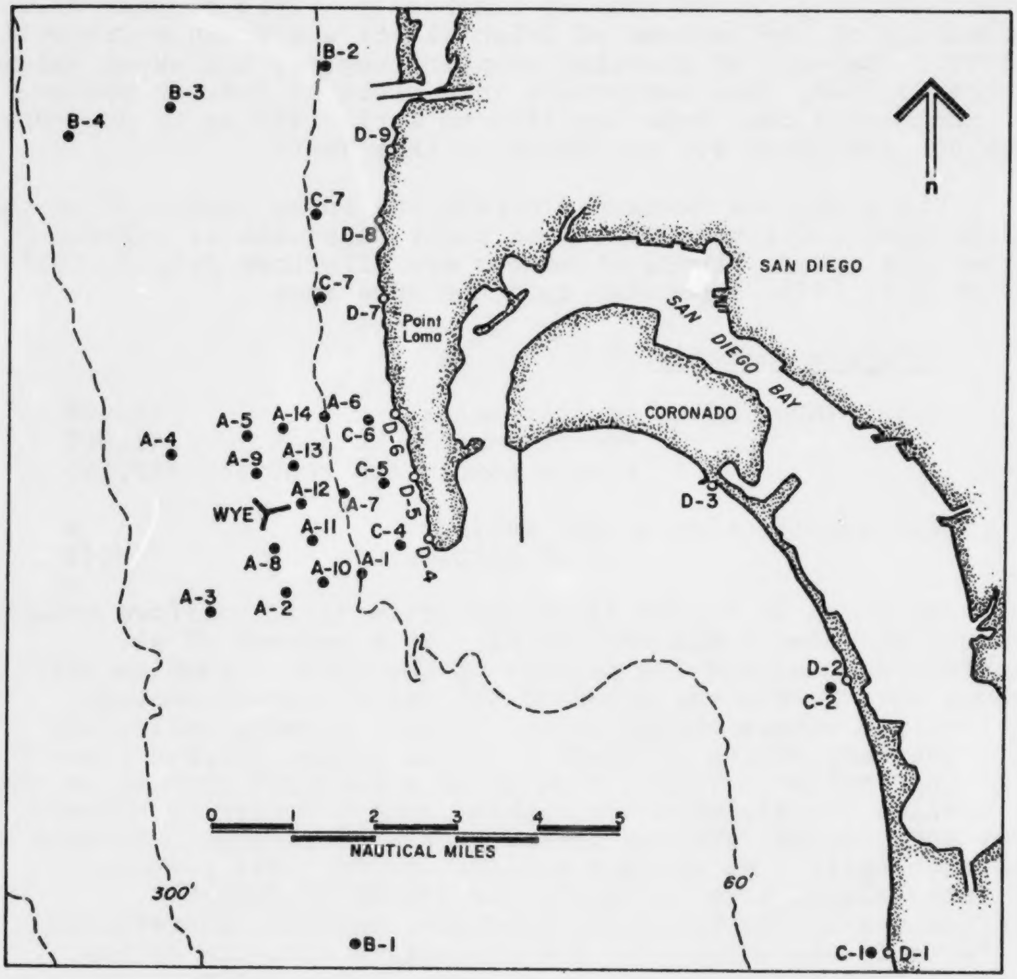


Figure II-32

POINT LOMA OUTFALL MONITORING STATIONS

Source: Orlob, 1975.

The monitoring data have been reviewed under the auspices of the Regional Board roughly biennially. This chapter draws primarily on the reviews of Orlob (1975) and Brown & Caldwell (1973). Because of changing sampling regimes and water quality concerns, many data series are incomplete or old. A review of monitoring data from May 1976 to April 1977 is in progress but not available for inclusion in this draft.

The standards mentioned herein are those contained in the NPDES permit for the Point Loma plant (Appendix A) unless otherwise noted. These standards are effective July 1, 1977 or July 1, 1978, depending upon the substance.

Coliform Bacteria.

Total (MPN/100-1)	monthly mean:	<1,000
	80% of month's samples:	<1,000
	single sample and repeat:	<10,000
For shellfishing areas,	median:	70
	90% of samples:	<230

As shown in Figure II-33 and Table II-23 coliform counts rarely exceeded 1,000 MPN/100 ml. 99.4 percent of all surface samples and 100 percent of the surface samples offshore were within the standard for water contact sports. Subsurface waters showed higher counts, perhaps reflecting the tendency of the effluent plume to remain trapped beneath the thermocline. Table II-24 shows a seasonal pattern in the shoreline counts, with the highest counts occurring between May and October, and the lowest counts occurring in January through April. No obvious explanation for this pattern exists, although it is likely the result of combined influences of thermal stratification, variable bactericidal effects of sea water, and the dispersive capacity of the outfall and the ocean off Point Loma (Orlob, 1975).

Transparency (Clarity). Standards:

1. The transmittance of natural light outside of the initial dilution zone to be reduced by more than one standard deviation from the mean determined for unaffected waters during the same period.

Natural fluctuations in transparency can be quite great, depending on wave turbulence, water temperature, phytoplankton productivity, depth, and other factors. Orlob (1975) found the hydrophotometer to be generally insensitive to changes in transparency in the range expected at the monitoring stations. Relying on Secchi disc readings, he found that transparency varied primarily with bottom depths (shallow water being somewhat less clear) and with season (see Table II-25 and

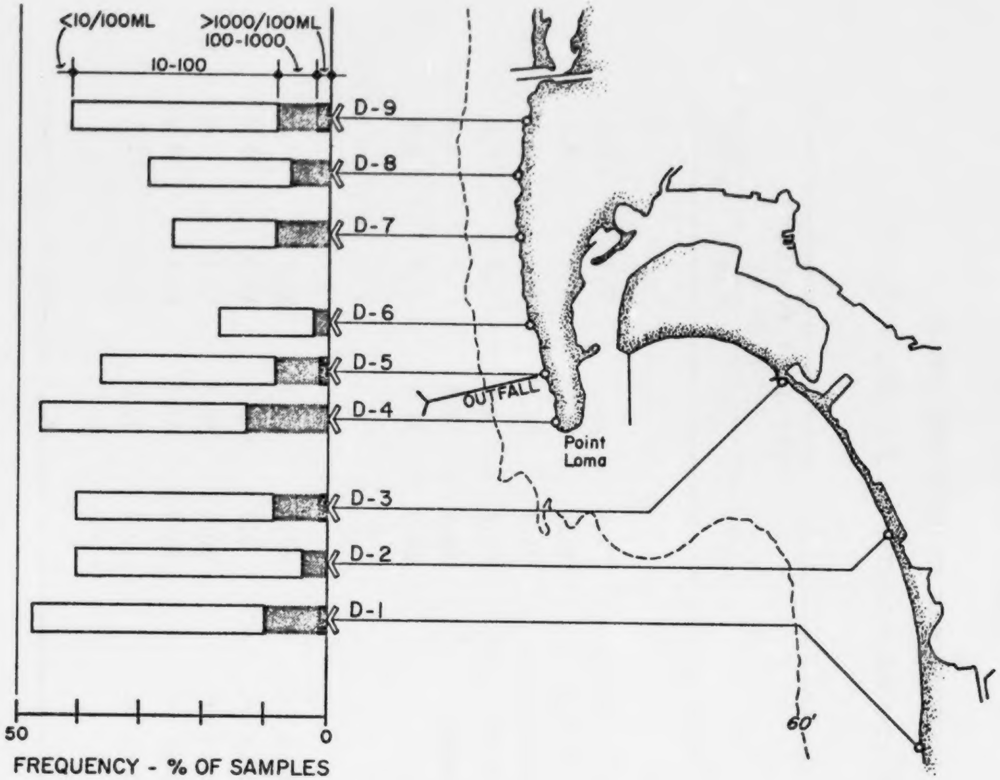


Figure II-33

FREQUENCY OF COLIFORM (MPN) COUNTS
SHORE STATIONS, POINT LOMA AND VICINITY, 1972-1974

Source: Orlob, 1975.

Table II-23

FREQUENCY OF COLIFORM (MPN) COUNTS,
POINT LOMA AND VICINITY, ALL STATIONS, 1972-1974

		FREQUENCY PERCENT MPN/100 mℓ			
		<10	≥10	≥100	≥1000
SURFACE SAMPLES					
GROUP I.	DIFFUSION	75.9	24.1	10.3	0.0
II.	DISPERSION	73.1	26.9	1.4	0.0
III.	INSHORE-DISP.	75.9	24.1	6.9	0.0
IV.	INSHORE-NORTH	86.2	13.8	1.7	0.0
V.	CONTROL	86.2	13.8	1.7	0.0
VI.	SHORE	63.9	36.1	7.7	0.6
DEPTH SAMPLES					
GROUP I.	50-60 ft.	17.3	82.7	62.1	37.9
II.	30-60 ft.	0.0	100.0	80.0	35.9
III.	15-20 ft.	50.6	49.4	11.5	0.0
IV.	30-40 ft.	22.4	77.6	56.9	17.2
V.	50-60 ft.	50.0	50.0	31.0	12.1

Source: Orlob, 1975.

Table II-24

SEASONAL VARIABILITY OF FREQUENCY OF COLIFORM (MPN)
COUNTS AT SHORE STATIONS, POINT LOMA AND VICINITY, 1972-1974

MPN/100 mℓ / Month→	J	F	M	A	M	J	J	A	S	O	N	D	Year
≥1000	0	0	1.9	0	0.9	1.9	0	1.4	0	0	0	0	0.6
≥100	1.9	6.2	4.1	1.9	10.2	9.3	7.4	9.7	5.6	5.6	22.2	13.9	7.7
≥10	7.4	20.4	11.1	16.7	57.4	40.7	44.4	52.8	37.5	33.3	36.1	36.1	36.1
<10	92.6	79.6	88.9	83.3	42.6	59.3	55.6	47.2	62.5	66.7	63.9	63.9	63.9

Source: Orlob, 1975.

Table II-25

SECCHI DISC OBSERVATIONS OFF POINT LOMA
1972-1974

Stations	Avg. Depth feet	Seasonal			Monthly		Daily	
		Min.	Mean	Max.	Min.	Max.	Min.	Max.
I. DIFFUSION ZONE	150	21.0	30.6	42.5	13.0	58.0	13.0	58.0
II. DISPERSION ZONE	66	20.3	26.9	32.5	15.7	47.0	10.0	57.0
III. INSHORE-DISPERSION	32	16.2	20.4	25.9	11.7	31.7	5.0	48.0
IV. INSHORE-NORTH	54	18.8	24.9	33.7	11.5	40.0	10.0	45.0
V. CONTROL	207	26.3	39.4	53.3	20.5	65.0	13.0	66.0

Source: Orlob, 1975.

Figure II-34). Within that variation, he found that readings near the outfall (diffusion zone) tended to be about 5 feet (15 percent) less than readings in similarly-situated stations far from the outfall. Brown & Caldwell (1973) reported a 5-10 percent reduction. Neither of these approaches the limit of one standard deviation, and both Orlob and Brown & Caldwell concluded that the wastewater effluent effects were insignificant.

Dissolved Oxygen. Standard: the discharge shall not cause the dissolved oxygen concentrations of waters outside the initial dilution zone to be depressed more than 10 percent from concentrations which occur naturally.

Dissolved oxygen concentrations depend on many naturally changeable conditions, including season and depth. Tibby (1961) recorded seasonal means for the La Jolla-Point Loma area of 7.6-11.2 mg/l (surface) and 5.5-7.8 (200 foot depths) during the years 1956-60. The City of San Diego measurement during May 1962-September 1963 (prior to use of the outfall) showed mean concentrations of 7.0-8.9 mg/l at the surface near the outfall, about 1.0 mg/l lower at a depth of 50-60 feet. Subsequent variations have been attributed to natural causes rather than effluent discharges (Brown & Caldwell, 1973).

Biological Oxygen Demand (BOD). Five-day 20° BOD not to exceed 30 mg/l (monthly average), 45 mg/l (weekly average) and 50 mg/l (daily maximum). BOD standards apply to the effluent rather than the receiving water; excess would reduce the dissolved oxygen supply. This has not been noted to date (Brown and Caldwell, 1973).

Temperature. Standard: none.

The temperature structure off Point Loma is discussed under Physical Characteristics of Receiving Waters. Orlob (1975) found that temperature variations generally worked to disperse the effluent without allowing it to rise to the surface. They found the data insufficient to separate natural temperature fluctuations from those induced by the effluent.

pH. Standard: the discharge shall not cause the pH outside of the initial dilution zone to be changed more than 0.2 units from the pH which occurs naturally. The receiving water pH is discussed under Physical Characteristics of Receiving Water. The pH of Point Loma waters remains within the permissible range (Brown & Caldwell, 1973).

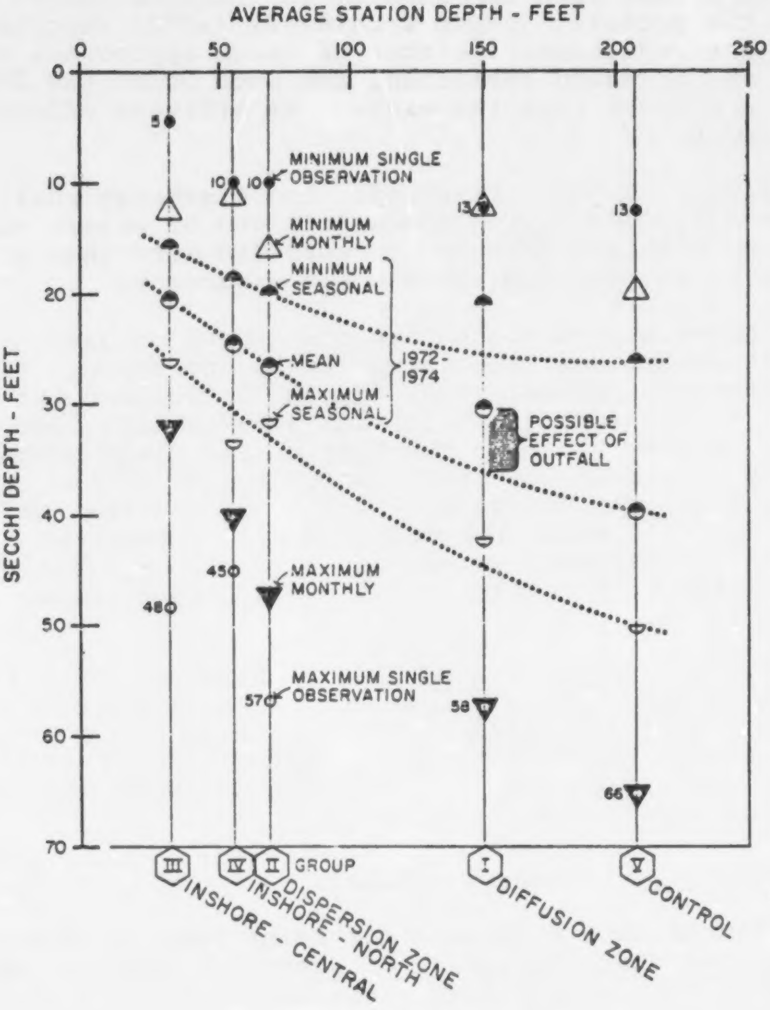


Figure II-34

SECCHI DISC OBSERVATIONS
OFF POINT LOMA, 1972-1974

Source: Orlob, 1975.

Toxic Materials (Heavy Metals, Chlorinated Hydrocarbons, Organics). Standard: See Tables VI-2 and II-26 for comparison of effluent limits and observed effluent concentrations.

Aesthetics. Standards:

The discharge shall not cause:

a) Floating particulates or grease and oil to be visible at any location.

b) Aesthetically undesirable discoloration on the ocean surface at any location.

No violation of these standards has been noted.

Grease and Oil. Standard: Effluent concentration not to exceed 10 mg/l fifty percent of the time, and 15 mg/l ten percent of the time.

Floating Particulate Matter. Standard: Effluent concentration not to exceed 1 mg/l fifty percent of the time, and 2 mg/l ten percent of the time.

Popular concern has focused on the worldwide presence of oil globs and slicks in ocean surface waters. These stem from a variety of sources such as ship bilges, oil spills, and natural oil seeps. The contribution of properly functioning sewage treatment plants to grease ar[illegible] patches in the world's oceans is considered minimal by comparison with other sources (see Ahearn, 1974).

Sediment Quality. Standards:

The discharge shall not cause:

1) Section F NPDES (See Appendix A of this EIS)

2) Section G NPDES (ditto)

3) Section H NPDES (ditto)

4) Section I NPDES (ditto)

Table II-26

PROPOSED LIMITS FOR SEVERAL TOXICANTS COMPARED WITH OBSERVED LEVELS

Material	Proposed* Limit (mg/l)	1973 Observed Range of Values** (mg/l)	1974+	Δ1975
Arsenic	.008	0.00 - .08	<.0311	<.001
Cadmium	.003	.004 - .05	.0215	0.0515
Chromium	.002	.050 - .26	.120	0.167
Copper	.005	.065 - .31	.0955	0.149
Cyanide	.050	0.00 - .025	0	0.001
Lead	.008	.043 - .66	.0551	0.1
Mercury	.00014	.00025 - .013	<.0007	0.00076
Nickel	.020	.025 - .33	.0413	0.16
Silver	.00045	.010 - .014	not available	0.0143
Zinc	.020	.050 - .96	.473	0.315

* Revised Water Quality Control Plan for Ocean Waters of California. SWQCB, 1976.

** Based on July 1971-December 1972 bimonthly effluent sample data, Brown and Caldwell, 1973.

+ January-October 1974 mean of monthly averages from NPDES monitoring data, City of San Diego (Lowry & Associates, 1976).

Δ 1975 average concentration, diluted 100-fold, from Schafer, 1976.

The City of San Diego has taken sediment samples at various points around the outfall since 1962, as part of its outfall monitoring program. Originally, samples were taken at each monitoring station (see Figure II-32), first at biweekly intervals and later at monthly intervals. Grabs of bottom deposits were collected monthly and screened for benthic animals. In 1967, seven stations were added and sampling was done biennially, only in the summer. Benthic animal samples were to be collected at 6-month intervals, instead of monthly or bimonthly as was the case in the first years of monitoring. To improve the statistical reliability of benthic animal enumeration, four replicates were processed for each semiannual monitoring of benthos. Also, in keeping with rising concerns for refractory materials in the environment, increased emphasis was placed on analysis for the presence of heavy metals and pesticide residues in the sediments and in animal inhabitants of the benthos.

This review draws primarily on reports by Orlob (1975) and Brown & Caldwell (1973). The standards are those set by the NPDES permit for Point Loma. These standards will not come into force until after the EPA secondary treatment standards are implemented. Most sediment data concern materials other than those mentioned in the regulations.

BOD. As early as 1965, Turner, et al., found that sediment samples taken adjacent to the outfall had a slight hydrogen sulfide odor. Following the sludge discharges of 1965-67 and 1968, Orlob (1975) documented the development and subsequent diminishment of sediment BOD around the outfall (see Figure II-35). Measurements of sediment BOD in 1962-63 showed background concentrations to be 1.0-1.5 mg/g. By 1970-71, this had risen to a maximum of 5.0 mg/gm near the outfall, decreasing in an elongated elliptical pattern oriented parallel to the shore. By 1972-73, the maximum had decreased to 3.0 mg/g, and the area within that contour had decreased substantially (see Table II-27). Orlob has noted that BOD concentrations of 2.0 mg/g correspond roughly with maximum biomass, and with plateaus in nitrogen and COD (Table II-28). The ecological impacts of these changes are discussed further in the section on "Marine Biology".

Nitrogen Organic Carbon and Sulfide. Brown & Caldwell (1973) reported data for organic carbon and concentrations in sediment samples taken between 1962-65 and for nitrogen concentrations in 1962-72 samples (Table II-28). The data suggest that nitrogen content has not changed appreciably. Organic carbon concentrations almost doubled within the area where BOD levels rose to or above 2.0 mg/g, and remained stable in other areas. No concentrations of sulfides have been reported.

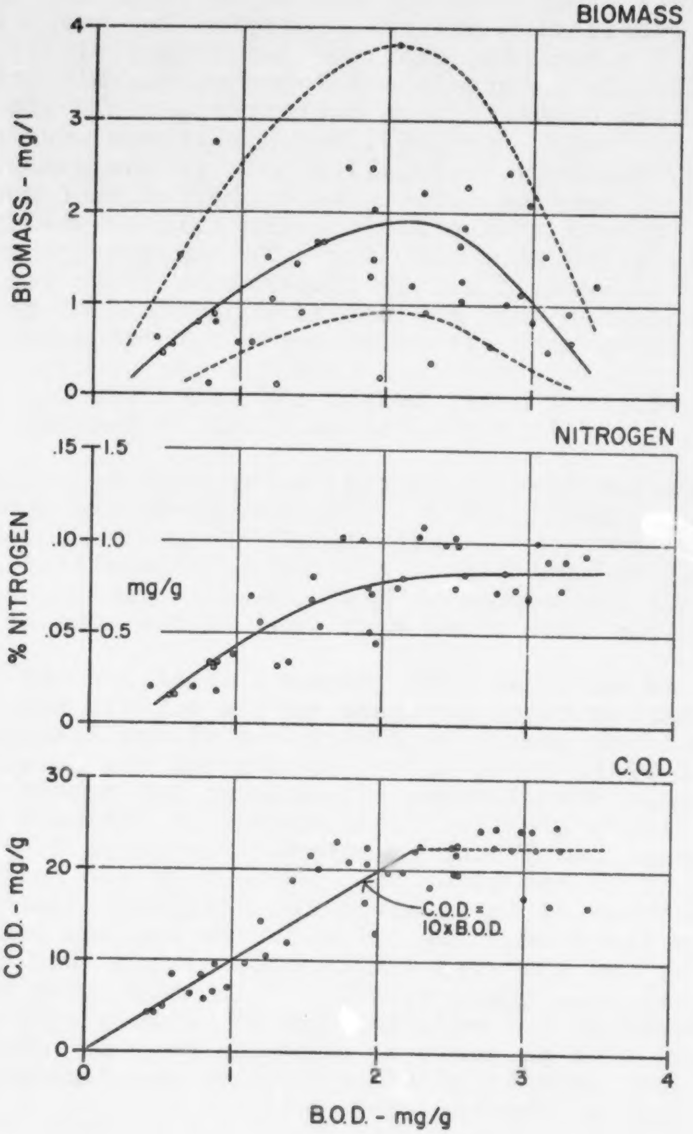


Figure II-35

RELATIONSHIP BETWEEN B.O.D.
AND OTHER PROPERTIES OF SEDIMENTS
IN THE VICINITY OF POINT LOMA OUTFALL, 1972-1974

Source: Orlob, 1975.

Table II-27

SEDIMENT BED ACCUMULATIONS
ATTRIBUTED TO THE POINT LOMA OUTFALL
1962-1974

Period	Area in Square Miles Included Within Contour of 2 mg/g	3 mg/g	4 mg/g	5 mg/g	Average BOD Load Within Dispersal Zone mg/g
1962-63	0	0	0	0	1.2
1964-65	--[1]	3	0	0	2.3
1966-67	--[1]	11	1	0	2.7
1968-69	--[1]	7	2	0	3.6
1970-71	18	5	2	1	3.4
1972-73	8	1	0	0	1.8
1974	12	0.7	0	0	1.7

[1] No estimate possible

Source: Orlob, 1975.

Table II-28

ORGANIC CARBON CONTENT 1962-1966, MEAN VALUE IN MG/G

Station Number	1962-63[a]	1963-64[b]	1964-65[c]
A-2	12.48	22.69	21.96
A-3	13.62	24.38	25.80
A-4	12.27	21.96	23.37
A-5	11.31	22.08	23.21
B-1	7.15	12.50	11.80
B-2	4.23	4.27	5.97
B-3	9.81	21.81	19.71
B-4	12.72	23.31	22.14

[a] Based on an average of 34 samples per station.
[b] Based on an average of 24 samples per station.
[c] Based on an average of 20 samples per station.

NITROGEN CONTENT IN POINT LOMA SEDIMENTS, 1962-1966, MEAN VALUE IN MG/G

Station Number	1962-63	1964-65	1966-67	1968-69	1971-72
A-2	.078	.070	.074	.075	.089
A-3	.085	.082	.086	.099	.088
A-4	.115	.078	.077	.084	.092
A-5	.082	.075	.076	.085	.095
A-8	-	-	-	.078	.088
A-9	-	-	-	.093	.077
A-10	-	-	-	.077	.057
A-11	-	-	-	.063	.072
A-12	-	-	-	.064	.058
A-13	-	-	-	.083	.069
A-14	-	-	-	.068	.069
B-1	.035	.036	.038	.032	.038
B-2	.022	.024	.020	.028	.016
B-3	.069	.777	.061	.065	.072
B-4	.080	.080	.081	.071	.080

Source: Brown & Caldwell, 1973.

Heavy Metals and Other Toxicants. Since 1971 sediment concentrations have been recorded semiannually for 12 heavy metal species: mercury, manganese, gold, cobalt, arsenic, cadmium, chromium, copper, lead, nickel, silver and zinc (Orlob, 1975; Brown & Caldwell, 1973). Galloway, using a different sampling regime, sampled the latter eight in 1970 (Southern California Coastal Water Research Project, 1973). Table II-29 reproduces the data given by Orlob (1975) for specific metals.

Southern California Coastal Water Research Project (1973) compared Galloway's data with similar samples taken off the White's Point, Hyperion, Orange County and Oxnard outfalls (see Table II-30), and with "background" concentrations derived from dated, varved sediments taken from anoxic Santa Barbara basins. Table II-31 shows that Point Loma sediment samples did not differ greatly with respect to metals content from those of other outfall areas. The Santa Barbara basin sediments were apparently not comparable with coastal sediments, as most pre-1860 "background" concentrations were higher than 1970-71 concentrations near the outfalls.

Table II-31

CONCENTRATION OF VARIOUS HEAVY METALS IN POINT LOMA SEDIMENTS, RELATIVE TO SEDIMENT SAMPLES FROM FOUR OTHER SOUTHERN CALIFORNIA OUTFALL AREAS (1970-71)

Below Average	Average	Above Average
Chromium	Silver	Iron
Zinc	Cadmium	
	Copper	
	Mercury	
	Manganese	
	Lead	

No sediment samples of cyanide, phenolic compounds, chlorinated hydrocarbons or radioactivity have been reported.

In summary, existing data document changes in sediments and benthic fauna apparently attributable to sewage discharge from Point Loma. These changes are similar to those observed in other southern California outfall areas and include increased biomass and abundance, and decreased diversity. Whether these changes in themselves are detrimental to the communities or ecosystem or human uses thereof is difficult to ascertain. Certainly changes in faunal diversity, resulting

Table II-29

HEAVY METAL CONCENTRATIONS IN SEDIMENTS AT SELECTED STATIONS NEAR THE POINT LOMA OUTFALL

JANUARY 1973

Heavy Metal	Concentration μg/g Sediment		
	B-3	A-3	A-12
Arsenic	1.6	<3.0	<1.1
Cadmium	<1.2	4.4	3.3
Chromium	38.8	12.4	3.2
Cobalt	0.8	2.5	<0.7
Copper	12.4	20.0	8.5
Gold	0.6	<1.0	<0.5
Lead	15.8	19.6	10.3
Manganese	36.7	68.0	2.9
Mercury	0.3	0.3	2.0
Nickel	2.0	6.0	1.8
Silver	0.5	0.9	0.9
Zinc	12.3	61.0	7.4

Source: Orlob, 1975.

Table II-30

ESTIMATED BACKGROUND CONCENTRATIONS (MG/DRY KG) OF TRACE METALS IN THE SEDIMENT AROUND MAJOR OUTFALL SYSTEMS

Metal	Whites Point	Santa Monica Bay	Orange County	Point Loma	Oxnard	Five-Area Mean (Nearshore Sediment Background Concentration)
Silver						
Mean	0.61	0.71	1.5	0.88	1.5	1.0
Std. Error	0.05	0.08	0.08	0.34	0.09	0.19
No. of Samples	9	11	30	4	3	5
Cadmium						
Mean	0.42	0.22	0.53	0.48	0.20	0.37
Std. Error	0.04	0.03	0.08	0.09	0.07	0.07
No. of Samples	9	11	19	4	3	5
Cobalt*						
Mean	9.3	5.0	---	---	---	7.2
Std. Error	1.0	0.27	---	---	---	2.2
No. of Samples	10	12	---	---	---	2
Chromium						
Mean	53	62	34	39	41	46
Std. Error	5.6	5.4	2.3	2.5	5.6	5.1
No. of Samples	10	11	30	5	5	5
Copper						
Mean	21	13	14	14**	18	16
Std. Error	2.3	1.0	1.5	---	2.9	1.5
No. of Samples	10	11	30	---	5	5
Iron						
Mean	27,000	20,000	---	29,000	---	25,000
Std. Error	1,500	1,600	---	810	---	2,700
No. of Samples	10	12	---	5	---	3
Mercury						
Mean	0.043	0.043	0.019	0.046	0.035	0.037
Std. Error	0.007	0.003	0.003	0.012	0.006	0.005
No. of Samples	5	9	5	6	5	5
Manganese						
Mean	390	230	390	280	---	320
Std. Error	11	22	15	9.0	---	40
No. of Samples	10	12	21	5	---	4
Nickel†						
Mean	17	15	9.4	---	---	14
Std. Error	1.2	1.1	0.71	---	---	2.0
No. of Samples	10	10	30	---	---	9
Lead						
Mean	6.2	6.9	10	7.5	12	8.5
Std. Error	1.0	0.60	1.2	1.8	1.5	1.1
No. of Samples	8	12	30	5	5	5
Zinc						
Mean	75	57	67	54**	61	63
Std. Error	4.0	4.6	3.7	---	4.4	3.7
No. of Samples	10	11	30	---	5	5

*These values are approximations ±50%

**Summary value; see Galloway (1972)

†These values are approximations ±30%

Source: Southern California Coastal Water Research Project, 1973.

* Background or pre-discharge metal concentrations are inferred from the levels found in bottom layers of core samples; in most cases, subsurface sediments have low and nearly constant metal levels which are assumed to represent pristine conditions. Pre-outfall surface sediment metal concentrations are not available.

in the extirpation of one or more species, would be considered by most to be detrimental. However, too little is known of the distribution and abundance of most marine benthic animals to allow an evaluation of the consequences of the observed changes in diversity. For example, a drop in the size of a local population of a cosmopolitan species is probably of less significance than a similar change in a population of an endemic species.

Various physical anomalies in fish, crustaceans and mollusks are being linked with waste discharge to ocean and estuarine waters. Numerous studies have investigated fish from the southern California bight, and found maximum frequencies of diseased fish in the Los Angeles area. Tumor-bearing Dover sole have been reported from the San Diego area. A recent study of fin erosion failed to detect this phenomenon in Dover sole collected off Point Loma. Although the causes of these afflictions are not clearly understood, their correlation with areas of urban pollution may indicate the presence of disease-causing substances in discharged wastewater. Certainly the ability to induce fin erosion in the laboratory by exposing healthy Dover sole to sediments from the Palos Verdes Shelf (the locality with the greatest frequency of diseased fish) supports this interpretation.

The discharge of sewage at Point Loma appears to have less effect on the physical and biological character of the area than has been found in Los Angeles discharge areas. Although changes have been noted, severe detrimental effects are largely conjectural. Secondary treatment of wastewater would ameliorate various adverse effects on individual organisms and species, but little can be said about the effects of upgraded treatment on the communities or ecosystem.

III. ENVIRONMENTAL SETTING - SOCIO-ECONOMIC

Knowledge of existing and projected population, economic and land use trends is fundamental to comprehensive sewerage planning. The quantity and characteristics of wastewater are directly related to increases in population, employment and acreage developed in the study area.

Population

San Diego County is the third most populous county in California, with a 1975 population of 1,593,800 residents (State Department of Finance estimates for July 1975; January 1977 estimates, 1,656,800.) The urbanized and only significantly populated area of the county lies to the west along the Pacific coast. The study area for this project encompasses the southern half of that populated area and includes the state's second largest city, San Diego. Population in the study area as of 1975 was estimated at 1,259,200 (CPO preliminary Series IV projections.)

Historic Growth

Historic population levels for all cities in the study area as well as San Diego County are shown in Table III-1. Population growth in San Diego County reflects the rapid pace of postwar population growth experienced throughout the State of California. The population of the county has increased over 45 times in this century - from 35,090 in 1900 to the aforementioned 1,593,800 in 1975. The growth during the last 35 years has been enormous: in the 1940's, population increased 92.4%; in the 1950's, 85.5%; and in the 1960's, a smaller but substantial 31.4%.

The City of San Diego, which is the population focus for both the county and the study area, has contributed a large but decreasing proportion of the county's growth. In 1950, the city had 334,387 residents, or about 60% of the county's population (County population in 1950 was 556,808.) By 1960, the city had increased to 573,224 residents (55% of the county total) and by 1970 to 696,769 residents (51%).

Chula Vista has been the second largest city in the study area for over 15 years. It, too, has experienced rapid growth in this century, increasing from a 1920 population of 1,718 to a 1975 population estimated at 74,300.

TABLE III-1

Population Growth in San Diego County

	Chula Vista	Coronado	Del Mar	El Cajon	Imperial Beach	La Mesa	National City	San Diego	Total County
1920									
Population	1,718	3,289		469		1,004	3,116	74,361	112,248
% Increase									
1930									
Population	3,869	5,425		1,050		2,513	7,301	147,995	209,659
% Increase	125.2	64.9		123.9		150.3	134.3	99.0	86.8
1940									
Population	5,138	6,932		1,471		3,925	10,344	203,341	289,348
% Increase	32.8	27.8		40.1		56.2	41.7	37.4	38.0
1950									
Population	15,927	12,700		5,600		10,946	21,199	334,387	556,808
% Increase	210.0	83.2		280.7		178.9	104.9	64.4	92.4
1960									
Population	42,034	18,039	3,124	37,618	17,773	30,441	32,771	573,224	1,033,011
% Increase	163.9	42.0		571.8		178.1	54.6	71.4	85.5
1970									
Population	67,901	20,910	3,956	52,273	20,244	39,178	43,184	696,769	1,357,854
% Increase	61.5	15.9	26.6	39.0	13.9	28.7	31.8	21.6	31.4

Source: U. S. Census, 1920-1970

Other cities in the study area, in order of 1975 population, are El Cajon, National City, La Mesa, Imperial Beach, Coronado and Del Mar.

Characteristics

The population characteristics of California and San Diego County residents are similar in many respects. In comparison to statewide characteristics, the county's population is younger and has a slightly lower median income. In 1970, the median age in the county was 25.6 years, compared to 28.1 for the state. The county had 31.9% of its population under age 18, while the state had 33.3%; the county had 8.7% of its population age 65 or over, while the state had 9.0%.

Median income in San Diego County in 1969 was $10,133, lower than the state median of $10,732. Similar proportions of both populations had poverty level incomes (8.6% in the county, 8.4% in the state), but the county had noticeably fewer families in the $15,000 and over income bracket (23.2% in the county, 26.7% in the state).

Within San Diego County, residents of the City of San Diego had generally higher income levels than residents of the rest of the county. Median income in the county was $9,895 in 1969, with 8.6% of the families having incomes below the poverty level; in the city, median income was a higher $10,167, but 9.3% of the families had incomes below poverty level. Income distribution in the state, county and city for 1969 is shown in Table III-2.

TABLE III-2

Distribution of Family Income
California and San Diego Region, 1969

Income Category	California	San Diego Region	City of San Diego
Under $4,000	12.3%	13.2%	13.4%
$ 4,000-$ 6,999	14.6%	16.5%	16.7%
$ 7,000-$ 9,999	18.4%	19.4%	18.9%
$10,000-$14,999	28.0%	27.6%	26.6%
$15,000-$24,999	20.6%	18.2%	18.8%
$25,000 & over	6.1%	5.0%	5.6%
Median	$10,732	$10,133	$10,166

Source: U. S. Census, 1970

Household size in San Diego County in 1970 was 2.94 persons, down from 3.1 in 1960 but just slightly smaller than the state's 2.95 average. The county's proportion of family households (as opposed to households comprised of unrelated individuals) decreased from 82.2 percent of the total in 1960 to 77.5 percent in 1970.

Distribution

Almost one-half of all San Diego County residents live in the City of San Diego. On July 1, 1975, the population of the city was estimated at 766,900 by the State Department of Finance, with an average population density of 2,400 persons per square mile. The second largest city in the service area was Chula Vista, with an estimated 1975 population of 74,300 and a density of 3,772 persons per square mile. Third was El Cajon, with a population of 59,300 and a density of 4,782; fourth was National City, followed closely by La Mesa. Population and densities as of July 1, 1975 are shown in Table III-3. For comparison, the table also shows populations and densities in 1960.

Table III-4 shows 1975 average dwelling unit densities by subregional area for the Metro service area and its vicinity. These densities were developed using the CPO 1975 data base for households and residential acreage. Figure III-1 locates the subregional areas.

Projections

The CPO Model. The San Diego Comprehensive Planning Organization (CPO) has projected population growth in the study area as part of a regional forecast. The CPO projection was developed from the Urban Development Model (PLUM - Projective Land Use Model) which uses assumptions about employment, available land, and travel times to forecast and distribute population, housing units, and urbanizing land area.

Specifically, PLUM requires as inputs data on the following factors: basic employment, incremental residential density available, and travel times between analysis zones. Basic employment is defined as employment in activities (industries) which product goods to be sold outside the local area. These activities locate in an area based on such factors as land costs and suitability, availability of transportation facilities, and proximity to resources. The basic employment increments for the time period of interest are developed for specific geographic locations.

TABLE III-3

Changes in Metropolitan Population Distribution and Densities

	Chula Vista	Coronado	Del Mar	El Cajon	Imperial Beach	La Mesa	National City	San Diego	Total San Diego County
1960									
Area[1]	11.4	5.4	1.7	9.8	4.4	7.4	7.5	197.2	4,255.0
Population	42,034	18,039	3,124	37,618	17,773	30,441	32,771	573,224	1,033,011
Density[2]	3,687	3,341	1,838	3,839	4,039	4,114	4,369	2,907	243
1975									
Area[1]	19.7	5.1	1.8	12.4	4.4	7.8	8.5	319.5	4,255.0
Population	74,300	19,100	4,700	59,300	20,800	42,400	43,450	766,900	1,542,500
Density[2]	3,772	3,745	2,611	4,782	4,727	5,436	5,112	2,400	363

[1] Land area in square miles
One square mile = 640 acres

[2] Persons per square mile.

Sources: 1960 Census and California State Dept. of Finance

TABLE III-4

Dwelling Unit Density: 1975

	Residential Acreage (thousands)	Occupied Dwelling Units (thousands)	Dwelling Units Per Acre
1 Central San Diego	4.8	51.7	10.8
2 Peninsula	3.2	21.8	6.8
3 Coronado	0.9	6.4	7.1
4 National City	2.1	13.3	6.3
5 Southeast San Diego	6.3	24.9	4.0
6 Mid City	6.1	44.5	7.3
10 Kearny Mesa	7.5	43.0	5.7
11 Coastal	5.6	32.6	5.8
12 University	1.3	6.3	4.8
13 Del Mar-Mira Mesa	3.0	11.3	3.8
14 North San Diego	1.8	7.2	4.0
15 Poway	2.6	9.3	3.6
16 Miramar	0.0	0.2	---
17 Elliot-Navajo	4.7	20.5	4.4
20 Sweetwater	1.9	5.2	2.7
21 Chula Vista	5.0	29.5	5.9
22 South Bay	3.3	18.7	5.7
30 Jamul	0.9	1.3	1.4
31 Spring Valley	4.3	11.4	2.7
32 Lemon Grove	1.9	7.4	3.9
33 La Mesa	4.3	19.2	4.5
34 El Cajon	7.9	27.4	3.5
35 Santee	2.4	10.4	4.3
36 Lakeside	4.7	9.7	2.1
37 Harbison-Crest	2.4	2.6	1.1
38 Alpine	1.8	1.7	.9
TOTAL	90.7	437.5	4.8

Source: Gruen Gruen + Associates, based on Comprehensive Planning Organization of the San Diego Region, February 1977, *Preliminary Series IV Forecasts by Subregional Areas 1975-95*

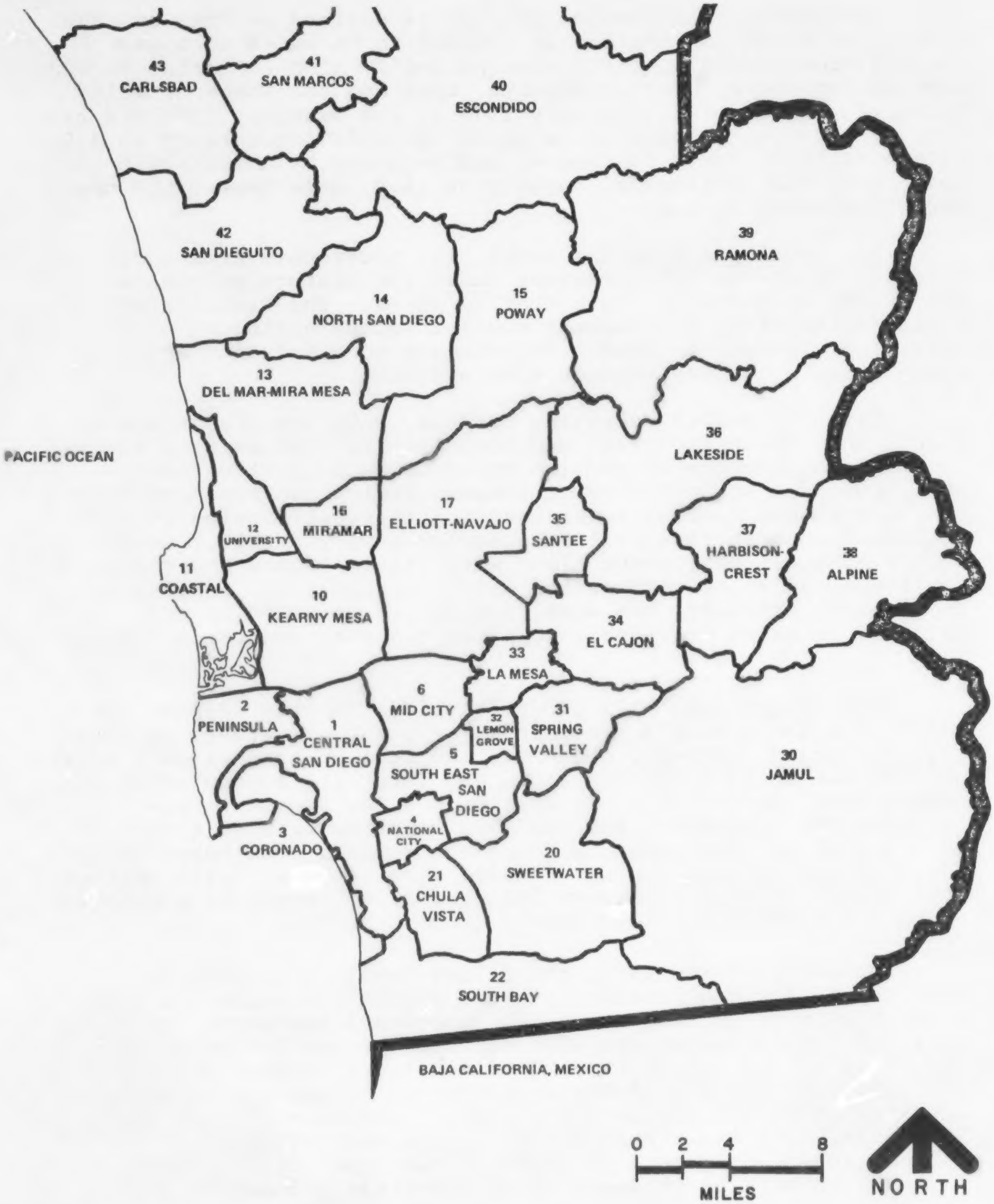


FIGURE III-1 SUBREGIONAL AREAS

Incremental residential density is defined as "the average density at which new housing is assumed to be added to a geographic area over a specific time period". (CPO's "Series IV Population Forecasts. Part A-Report. Land Use and Transportation Assumptions", page 11, February 1977.) For example, if there are four single-family homes on an acre, the existing density is 4.0; if one of those homes is removed and replaced by a four-unit apartment, the incremental density is 16.0, even though the new overall density is 7.0.

For development of the model, the geographic area under consideration - in CPO's current case, the western portion of the county - is divided into traffic zones. The travel time input to the Urban Development Model involves estimates of the time it would take to travel between one zone and another, presumably for a journey between home and work.

Using a complex weighting formula, PLUM translates these inputs into "accessibility" and "opportunity" values as a means of approximating the attraction value of each traffic zone. This procedure accomplished, the model assigns workers and their families to the various zones based on their attraction values, estimates and distributes local-serving (e.g., retail, service, public schools) employment along with its employees and their families, and allocates housing units for the total incremental population. Finally, the zonal totals are compared to and adjusted to match previously supplied regional control totals.

CPO Projection. All CPO projections in this chapter are taken from the agency's Preliminary Series IV Forecasts by Subregional Areas, 1975-95, which are the most up-to-date data available at the writing of this EIS. CPO forecasts a population increase over the entire study area of 604,000 people - from 1,242,200 to 1,863,200 - between 1975 and 1990. The Sweetwater subregion is expected to experience the greatest growth, both numerically (78,100) and in relation to its 1975 size (415.2%), with most of that growth occurring between 1985 and 1990. Forecast population changes are shown in Table III-5.

Between 1975 and 1985, the Elliot-Navajo subregion is expected to see the greatest numeric population increase, with a total gain of 34,800 residents. Southeast San Diego, University and Spring Valley are also expected to see increases of 10,000 to 15,000 people in each of the two five-year periods (1975-80 and 1980-85); Poway is projected to experience that level of growth in the latter period. Increases of less than 1,000 residents in each five-year period are anticipated in Miramar (where no growth is expected over the entire projection period) as well as in Jamul, Harbison-Crest and Alpine subregions.

TABLE III-5

CPO Population Forecast (thousands)

	Population				
Subregion	1975	1980	1985	1990	1995
1 Central San Diego	118.4	121.8	124.8	133.5	142.8
2 Peninsula	76.2	77.2	78.1	78.7	79.2
3 Coronado	18.6	20.8	22.7	22.7	22.7
4 National City	44.7	46.0	47.3	47.3	47.3
5 Southeast San Diego	86.0	96.1	107.8	110.2	112.3
6 Mid-City	104.9	107.0	109.1	111.4	113.4
10 Kearny Mesa	128.2	132.8	137.8	136.9	135.8
11 Coastal	71.1	73.7	76.4	78.9	81.3
12 University	21.0	34.0	50.7	51.0	51.3
13 Del Mar-Mira Mesa	36.1	47.6	63.9	83.3	100.1
14 North San Diego	19.3	27.4	37.0	50.7	62.6
15 Poway	32.0	41.5	51.6	75.3	97.0
16 Miramar	3.0	3.0	3.0	3.0	3.0
17 Elliot -Navajo	67.4	84.5	102.2	102.4	102.3
20 Sweetwater	18.8	28.5	37.4	69.1	96.8
21 Chula Vista	80.9	86.6	92.9	94.7	96.2
22 South Bay	65.4	71.3	77.8	84.0	89.5
30 Jamul	4.2	5.0	5.9	11.8	17.2
31 Spring Valley	36.7	47.5	59.1	63.7	67.9
32 Lemon Grove	22.3	24.7	27.2	27.4	27.5
33 La Mesa	49.8	52.2	54.7	56.2	57.6
34 El Cajon	77.7	86.4	95.7	105.1	113.5
35 Santee	34.6	40.5	46.9	51.2	54.9
36 Lakeside	30.0	34.6	39.5	52.0	62.9
37 Harbison-Crest	7.5	8.2	8.9	15.1	20.8
38 Alpine	4.5	5.0	5.7	6.5	7.3
TOTAL	1259.2	1403.9	1564.1	1772.1	1863.2

Source: Comprehensive Planning Organization of the San Diego Region, February 1977, Preliminary Series IV Forecasts by Subregional Areas 1975-95

Between 1985 and 1995, Sweetwater is expected to gain 59,400 new residents. Poway, Del Mar-Mira Mesa, North San Diego, and Lakeside are expected to follow, in that order, as leaders in population increase. The smallest gains are anticipated in Alpine (1,600), Peninsula (1,100), Elliot-Navajo and Lemon Grove (300 each), while Miramar again experiences no change and Kearny-Mesa loses 1,800 residents.

Overall, subregions generally on the northern and eastern perimeter of the study area are expected to experience the greatest proportional population gains, while Peninsula, Kearny-Mesa, Mid-City, Miramar and National City experience the smallest. Similarly, those generally on the northern and eastern perimeter are projected to account for larger proportions of the west county's total population by 1995, while the others are expected to account for smaller proportions. These characteristics are shown in Table III-6.

The number of households in the study area is expected to increase by almost two-thirds between 1975 and 1995, from 437,600 to 720,400. Sweetwater is expected to accommodate the greatest number of additional households (30,200), followed by Del Mar-Mira Mesa, Poway and North San Diego. Sweetwater will also see the greatest proportional increase in number of households (583.4%); second will be Jamul (393.1%), followed by North San Diego and University. Household projections are shown in Table III-7.

According to the CPO forecast, the Central San Diego and University subareas will experience the greatest increase in household density. In 1975, Central San Diego averaged 10.8 households per acre and University averaged 4.8. In 1995, Central San Diego is expected to average 14.6 and University 8.4, for a gain of over three units per acre in each. Increases of two or more households per acre are anticipated in Coronado, Mid-City, Kearny-Mesa and Lemon Grove. Miramar, on the other hand, is expected to lose an average of 1.8 households per acre. The projected 1995 dwelling densities are shown in Table III-8.

Comparison Projection: State Department of Finance. The California State Department of Finance makes population forecasts for counties based on assumptions about fertility rates and migration. (Mortality rates are ignored because they have varied little over the past two decades and are expected to remain steady.)

TABLE III-6

Selected Characteristics of Population Change 1975-1990

	Subregion	Total % Change	Change in % of Regional Population	
			Gain	Loss
1	Central San Diego	20.6		1.8
2	Peninsula	4.0		1.6
3	Coronado	22.0		0.3
4	National City	5.7		0.9
5	Southeast San Diego	30.6		0.9
6	Mid-City	8.1		2.1
10	Kearny-Mesa	5.9		2.6
11	Coastal	14.3		1.2
12	University	144.2	0.7	
13	Del Mar-Mira Mesa	177.2	1.9	
14	North San Diego	225.3	1.4	
15	Poway	202.9	1.9	
16	Miramar	0.9		0.1
17	Elliot-Navajo	52.0	0	
20	Sweetwater	415.2	1.8	
21	Chula Vista	18.9		1.2
22	South Bay	36.9		0.5
30	Jamul	310.3	0.4	
31	Spring Valley	84.7	0.4	
32	Lemon Grove	23.1		0.3
33	La Mesa	15.6		0.8
34	El Cajon	46.0		0.3
35	Santee	58.8	0.1	
36	Lakeside	109.4	0.7	
37	Harbison-Crest	175.5	0.4	
38	Alpine	61.7	0	
	TOTAL			

Source: Gruen Gruen + Associates based on Comprehensive Planning Organization of the San Diego Region, February 1977, Preliminary Series IV Forecasts by Subregional Areas, 1975-95.

TABLE III-7

Number of Households Projection 1975-1995
(thousands)

Subarea	1975	1980	1985	1990	1995
1 Central San Diego	51.7	54.0	56.4	62.1	67.1
2 Peninsula	21.8	22.6	23.5	24.0	24.5
3 Coronado	6.4	7.5	8.6	8.8	8.8
4 National City	13.3	14.1	14.9	15.0	15.1
5 Southeast San Diego	24.9	29.7	34.7	36.1	37.3
6 Mid-City	44.5	46.1	47.8	49.3	50.6
10 Kearny-Mesa	43.0	45.9	48.9	49.0	49.0
11 Coastal	32.6	34.2	35.9	37.5	38.8
12 University	6.3	14.3	22.7	23.1	23.5
13 Del Mar-Mira Mesa	11.3	17.4	23.9	33.2	41.2
14 North San Diego	7.2	10.9	14.7	21.5	27.2
15 Poway	9.3	13.5	17.9	26.9	34.7
16 Miramar	0.2	0.2	0.2	0.2	0.2
17 Elliot-Navajo	20.5	27.8	35.4	36.0	36.5
20 Sweetwater	5.2	8.9	12.8	24.9	35.4
21 Chula Vista	29.5	32.8	36.3	37.4	38.4
22 South Bay	18.7	21.5	24.5	27.3	29.6
30 Jamul	1.3	1.6	2.0	4.3	6.2
31 Spring Valley	11.4	16.3	21.6	23.6	25.3
32 Lemon Grove	7.4	8.5	9.7	9.8	9.9
33 La Mesa	19.2	20.5	21.9	22.6	23.2
34 El Cajon	27.4	31.8	36.4	40.1	43.3
35 Santee	10.4	13.4	16.5	18.2	19.6
36 Lakeside	9.7	11.9	14.3	19.4	23.8
37 Harbison-Crest	2.6	2.9	3.3	5.9	8.1
38 Alpine	1.7	2.0	2.3	2.7	3.1
TOTAL	437.6	510.3	587.1	658.9	720.4

Source: Comprehensive Planning Organization of the San Diego Region, Febrary 1977, Preliminary Series IV Forecasts by Subregional Areas, 1975-95.

TABLE III-8

Forecast Dwelling Unit Densities (thousands)

		Residential Acreage	1955 Occupied Dwelling Units	Dwelling Units per Acre
1	Central San Diego	4.6	67.1	14.6
2	Peninsula	3.2	24.5	7.7
3	Coronado	1.1	8.8	8.0
4	National City	2.1	15.1	7.2
5	Southeast San Diego	9.1	31.3	4.1
6	Mid-City	5.8	50.6	8.7
10	Kearny-Mesa	8.3	49.0	5.9
11	Coastal	5.9	38.8	6.6
12	University	2.8	23.5	8.4
13	Del Mar-Mira Mesa	11.0	41.2	3.7
14	North San Diego	7.7	27.2	3.5
15	Poway	9.7	34.7	3.6
16	Miramar	0.0	0.2	---
17	Elliot-Navajo	8.5	36.5	4.3
20	Sweetwater	10.2	35.4	3.5
21	Chula Vista	5.4	38.4	7.1
22	South Bay	6.1	29.6	4.9
30	Jamul	3.5	6.2	1.8
31	Spring Valley	7.9	25.3	3.2
32	Lemon Grove	2.1	9.9	4.7
33	La Mesa	4.3	23.2	5.4
34	El Cajon	10.2	43.3	4.2
35	Santee	4.3	19.6	4.6
36	Lakeside	7.3	23.8	3.3
37	Harbison-Crest	4.0	8.1	2.0
38	Alpine	2.0	3.1	1.6
	TOTAL	142.5	720.4	5.1

Source: Gruen Gruen + Associates based on Comprehensive Planning Organization of the San Diego Region, February 1977, Preliminary Series IV Forecasts by Subregional Areas, 1975-95.

A fertility rate is the average number of live births per woman. The rate may be measured either (1) by adding the age-specific birth rates for each year of the childbearing period during a single calendar year, or (2) by adding the age-specific rates for a cohort (that is, a specific group, defined by its year(s) of birth) year-by-year, as it passes through the childbearing period. The California Department of Finance uses the latter method.

Migration is simply the movement of people between or among different areas. It is composed of two factors: in-migration and out-migration.

The Department of Finance publishes several projections, each based on different assumptions about the fertility rate and migration pattern. The State Water Quality Control Board has adopted two of those projections - D-150 and E-O - to the San Diego Region basin, which is similar to the study area. The D-150 series assumes a fertility rate of 2.5 - that is, that the average woman will bear 2.5 children during her lifetime - and net migration into the state of 150,000 people. The E-0 series assumes a fertility rate of 2.1 and a net migration balance. The most recent projections were made by the Department of Finance in 1974.

The D-150 projection anticipates population growth in the study area of 619,650 between 1975 and 1995, with the number of residents increasing from 1,254,550 to 1,874,200. The E-0 projection anticipates a growth of 402,750 people, with the number of residents rising from 1,221,400 to 1,624,150. The two Department of Finance projections and the CPO Series IV projection are compared in Table III-9.

Comparison to the Facilities Plan. The Metropolitan Facilities Plan utilized CPO's Series II forecasts for population instead of the more recent Series IV forecast. Series II projects a higher growth rate and population level for the study area. In 1975, for example, Series II projected population for the area at 1,272,800, while the Series IV data base estimates it as 1,259,200. By 1985, the two series differ by 70,200; Series II forecasts a population of 1,634,100 and Series IV forecasts 1,564,100. The difference increases further over time, so that by 1995, the Series II forecast of 2,004,400 people in the area is 141,200 higher than the Series IV forecast. The differences are summarized in Table III-10.

TABLE III-9

Comparison of E-0, D-150 and CPO Population Estimates for the Study Area

Population Projection Curve	1975	1980	1985	1990	1995
E-0	1,221,400	1,329,600	1,433,300	1,537,000	1,624,150
D-150	1,254,550	1,395,900	1,580,600	1,765,300	1,874,200
CPO	1,259,200	1,403,900	1,564,100	2,202,200	2,400,300

The California Department of Finance E-0 and D-150 population projections are from the State Water Resources Control Board and California Water Quality Control Board, San Diego Region Basin study, dated April, 1974. (1975, 1985, 1995 estimates interpolated from curves).

CPO population projections from 1977 Preliminary Series IV Forecasts by Subregional Areas 1975-95.

TABLE III-10

Comparison of Series II and Series IV Population Forecasts: Study Area

Year	1975	1980	1985	1990	1995
Series II	1,272,800	1,449,700	1,634,300	1,820,500	2,004,400
Series IV	1,259,200	1,403,900	1,564,100	1,722,100	1,863,200
Difference	13,600	45,800	70,200	98,400	141,200

Source: Gruen Gruen + Associates based on Comprehensive Planning Organization of the San Diego Region, 1974 Regional Comprehensive Plan Forecasts by Subregional Areas 1973-95, and 1977 Preliminary Series IV Forecasts by Subregional Areas 1975-95.

Local Reaction to Population Projections

Preliminary Series IV forecasts were published in February 1977. The jurisdictions in the study area were contacted in May 1977 to find out how those forecasts compared to their independent forecasts and what, if anything, would be done to reconcile any differences that had occurred.

Most of the cities in the study area substantially agree with the CPO preliminary Series IV population forecast. Coronado and Imperial Beach have significantly higher forecasts of their own. The City of San Diego agrees with the total figure but not with its distribution within the city. San Diego County has several planning areas in which the community goal population differs from the preliminary forecast. Several of these jurisdictions noted that, as Series IV is finalized, there will be ongoing interaction between CPO and the local agencies to reconcile any differing forecasts.

The cities and county areas are discussed individually below.

Chula Vista. Chula Vista notes some discrepancies between its forecast and CPO's: the city had forecast a 1995 population of 125,000, higher than CPO's expected 114,700. This difference stems partly from a difference of almost 4000 people in the 1975 population estimates, with Chula Vista's projected 79,000 in that year larger than CPO's data base number. At this point, city personnel describe themselves as pretty happy with the CPO forecast and feel that it is, if anything, a little high. The city has not yet decided whether to take planning action in response to the CPO forecasts. A reduction in multiple family dwelling holding capacity, which would reduce ultimate population, is considered a possibility. (Norman Williams, Assistant Planner.)

Coronado. The city's official population forecast is nearly 50 percent higher than CPO's. Coronado has adopted a forecast of 31,379 in 1990, while CPO projects only 22,700 people by 1995 (unchanged from 1985). Estimated 1975 population was 18,600. The city has taken no action on the CPO forecast. (Tony Peña, Assistant Planner.)

Del Mar. Del Mar comprises such a small portion of the Del Mar-Mira Mesa subregional area that a valid comparison cannot be made between its corporate population projection and CPO's forecast for the area. For information, the city's General Plan calls for a 1990 population of 6,700, up from the 1975 level of 4,770. (Diane Leonard, Planning Secretary.)

El Cajon. El Cajon has accepted the CPO forecast with some added population to account for the fact that the city is larger in size than the planning area. According to the Planning Director, the CPO 1995 projection for the planning area is 123,100 and the city's forecast is 128,000. The General Plan calls for a population of 115,000 in 1990, which is generally consistent with the 1995 forecasts. (Ray Hanson, Planning Director.)

Imperial Beach. Imperial Beach has a higher forecast than CPO. The city's General Plan calls for a 1990 population of 27,000. CPO, in contrast, forecasts population in 1985 at 20,992 and in 1995 at 21,098. The differences appear to stem from several sources: (1) CPO foresees smaller family sizes than does the General Plan; (2) CPO assumes that the Beachfront redevelopment area will not develop at maximum density, and (3) the General Plan contains some features that will be impossible to implement. The Planning Director points out that Imperial Beach's slow growth in the early 1970's - population increased from 20,244 in 1970 to 20,753 in 1975 - tends to support the CPO forecast. (Jim Butler, Planning Director.)

La Mesa. La Mesa agrees with the CPO forecast, noting that city staff was contacted to provide inputs for the model. (Mike Hughes, Assistant City Manager.)

National City. National City also agrees with the CPO forecast. City personnel suspect that the preliminary Series IV numbers might be a little conservative when compared to the General Plan holding capacity, but have not done any independent analyses which could provide a basis for challenging CPO. (Rolf Gunnerson, Assistant Planning Director.)

San Diego. San Diego, as noted before, agrees with the preliminary overall city population forecast but disagrees with the distribution of that population among its geographic areas. City personnel point out that the preliminary forecast assigns population increments to new suburban areas rather than to existing redevelopment and infill locations. The discrepancies are apparent in Table III-11, with reference to Figure III-2.

The table shows that the main areas of disagreement are Coastal, North San Diego, and South San Diego. Staff has been working with CPO to reconcile the figures and is hopeful that the differences will be resolved, mainly toward the city's forecast, during the finalization process for Series IV. (Marion Munsel, Associate Planner.)

San Diego County. San Diego County has seven community planning areas in the study area. Of these, three - Alpine, Santee and Lemon Grove - are in general agreement with the preliminary Series IV forecast. For Alpine, the CPO 1995 forecast is 9,200 people and the community goal is 9,500 to 12,000 people. For Santee, CPO forecasts a population of 63,000 while the goal is a population of 50,000 to 100,000. In Lemon Grove, CPO expects 31,500 people; the community goal is 30,000.

TABLE III-11

Projected Population Distribution
City of San Diego
(thousands)

Area	City Forecast 1975	City Forecast 1995	CPO Forecast 1975	CPO Forecast 1995
Central	108.3	141.2	118.4	142.8
Coastal	157.3	184.3	147.3	160.5
Eastern	252.2	321.8	254.9	319.8
Kearny-Mesa	149.2	186.9	149.2	187.1
North San Diego	59.1	145.9	58.6	177.5
South San Diego	44.3	69.9	44.5	63.0
TOTAL	770.4	1050.0	772.9	1050.7

Source: City of San Diego Planning Department

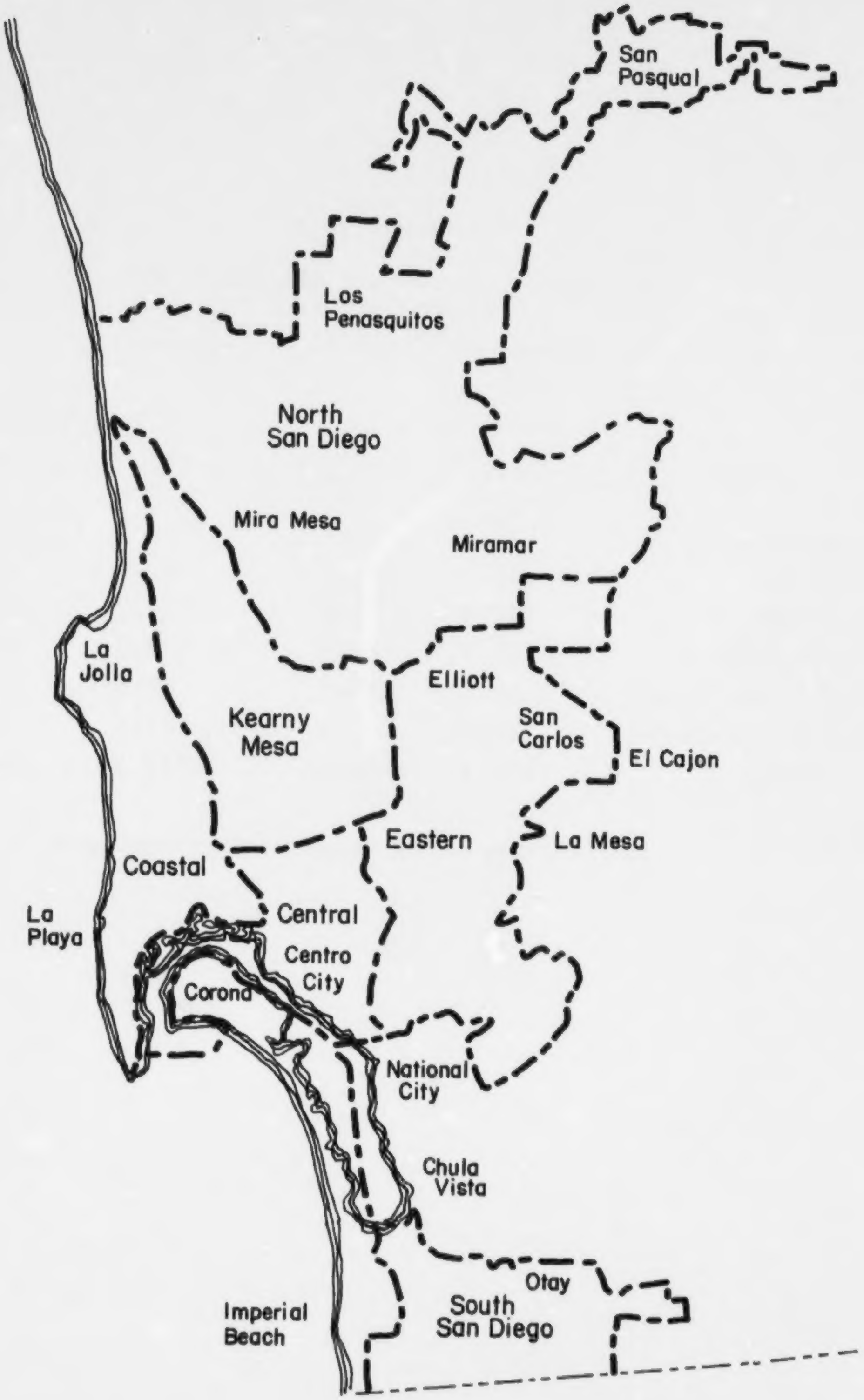


FIGURE III -2. CITY OF SAN DIEGO PLANNING AREAS

In the other four areas, CPO and the community goals differ measurably, as indicated in the table below (see also Figure III-3).

TABLE III-12

Population Forecasts for Community Planning Areas
San Diego County

Area	CPO: 1995	Community Goal
Lakeside	77,100	50,000
Poway	84,000	45,000
Sweetwater	54,300	20,000
Valley De Oro	108,300	94,000

Source: County of San Diego Planning Department.

County staff state that the Board of Supervisors considers the community goals to be the proper forecasts. They further note, as did City of San Diego staff, that they expect the differences between the forecasts to be resolved - mainly toward the county numbers - as Series IV is finalized. (Randy Hurlburt, Environmental Planning Director.)

Household Projection. The CPO data base for 1975 shows that there were 437,500 occupied housing units in the study area at that time, with an average household size of 2.71 people. They forecast an increase to 720,400 households in 1995, with an average household size at that time of 2.47. This decrease in household size is consistent with current county and statewide trends. The projections for household population, occupied housing units, and resulting average household size are shown in Table III-13.

TABLE III-13

Household Size Forecast

Year	Household Population	# of Occupied Housing Units	Average Household Size
1975	1,188,100	437,500	2.71
1980	1,327,100	510,300	2.60
1985	1,485,800	587,100	2.53
1990	1,640,300	658,900	2.49
1995	1,776,900	720,400	2.47

Source: Gruen Gruen + Associates based on Comprehensive Planning Organization of the San Diego Region 1977 Preliminary Series IV Forecasts by Subregional Areas 1975-95.

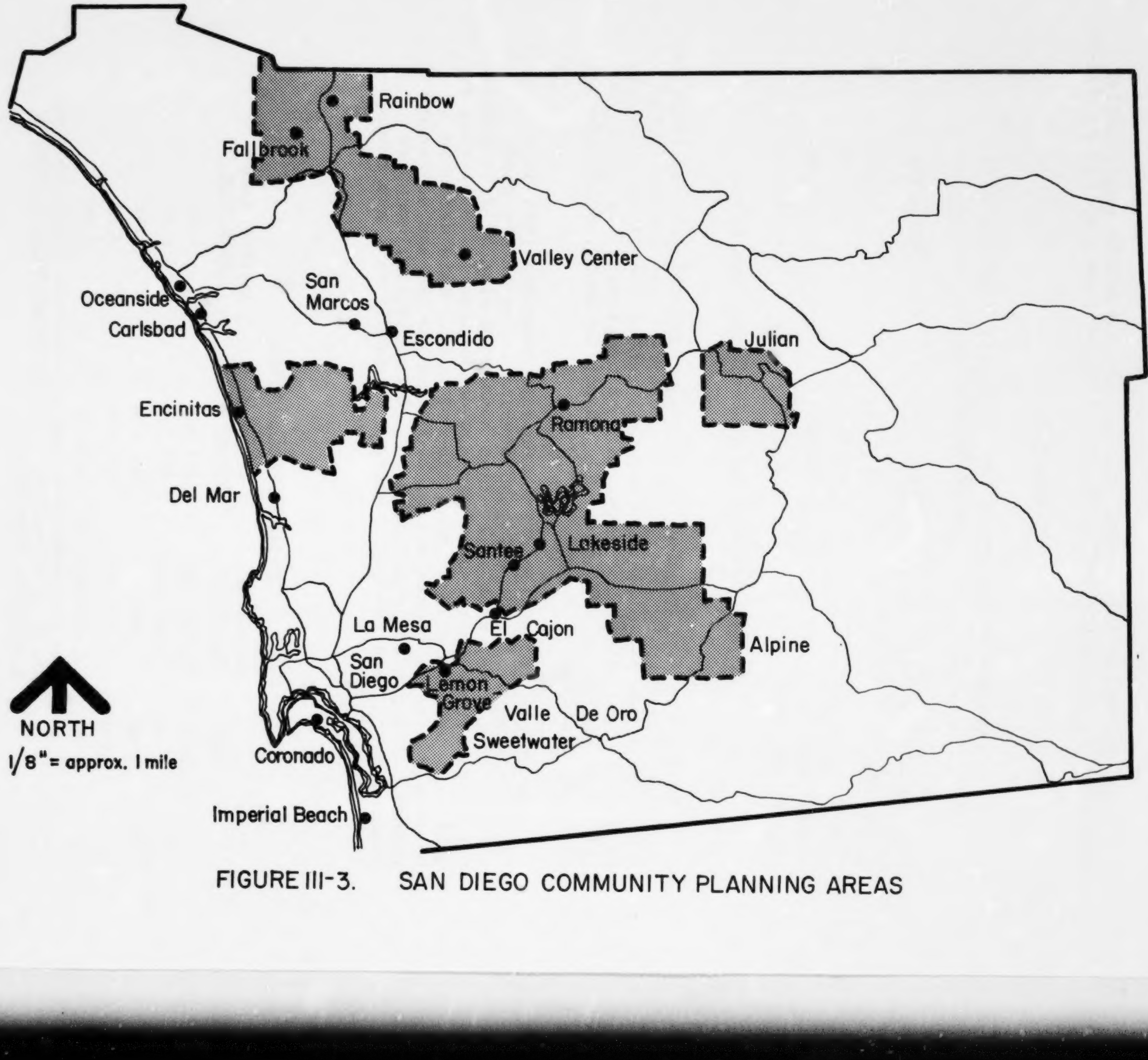


FIGURE III-3. SAN DIEGO COMMUNITY PLANNING AREAS

Population in Tijuana, Baja California, Mexico. The City of Tijuana is the largest in Baja California, with a 1970 population of 340,583 and a 1974 population estimated at 400,000 (Mitchell Research Associates, Potential Economic and Environmental Consequences of the San Diego/Tijuana Air Carrier Airport Alternative, May 1974, for CPO.) According to Mitchell Research Associates in a report prepared for CPO, the city's population is likely to more than quadruple its 1970 size by the year 2000, reaching a level at that time of 1,469,308.

The addendum to the Facilities Plan includes, in addition to the Mitchell Research Associates projection, a forecast for Tiajuana based on an annual growth rate of 5.8%. That forecast estimates the 1980 population at 629,000, the 1990 population at 1,106,000, and the 2000 population at 1,943,000.

To confirm these forecasts, Gruen Gruen + Associates contacted officials in the City of Tijuana. (Letters from Gruen Gruen + Associates to Juan Ojeda Robles, General Manager, Comision Estatal de Servicios Publicos de Tijuana and to Fernando Marquez Arce, Mayor of Tijuana, April 27, 1977.) The Comision Estatal de Servicios Publicos responded that, while the 1970 Mexican census put the population at 340,583, they estimate that it misses about 10% of the population and consider the actual population to be closer to 374,388.

The Comision also forwarded two population forecasts. The first assumes that the adjusted population figure is the correct one and that growth will occur at an annual rate of 6.88% (3.7% natural increase plus 3.1% immigration from other Mexican states). The second forecast assumes that the unadjusted census figures apply and that the growth rate will decrease gradually from 6% in 1970-71 to 4% in 1989-90. The forecasts available for Tijuana are compared in Table III-14.

TABLE III-14

Tijuana, Mexico Population Projections

Year	Mitchell Research Associates	Addendum	Comision: Adjusted Basis	Comision: Unadjusted Basis
1970	340,583	340,583	374,388	340,583
1980	609,746	629,000	728,669	620,039
1990	992,910	1,106,000	1,418,204	1,016,200
2000	1,469,308	1,943,000		

Source: Mitchell Research Associates, Potential Economic and Environmental Consequences of the San Diego/Tijuana Air Carrier Airport Alternative, May 1974; Lowry Associates, San Diego Metropolitan Facilities Plan Report Addendum, Part 15, January 1977; and Comision Estatal de Servicios Publicos de Tijuana, April 1977 letter to GG+A.

While the Comision has no estimates for population in the year 2000, it is clear from the above table that both its forecasts are higher than the Mitchell Research Associates forecasts used in the Facilities Plan and one is higher than the second forecast used in the Facilities Plan Addendum. The Comision anticipates a 298% (unadjusted basis) to 379% (adjusted basis) increase in the city's population by 1990, while Mitchell expects a 292% increase and the Addendum forecast a 325% gain.

Summary: Population Trends

The total population of the San Diego study area, including Tijuana, was estimated to be between 1,729,700 and 1,781,400 in 1975. The forecasts described in this section anticipate a population of between 2,765,000 and 3,190,300 in 1990, as shown in Table III-15.

TABLE III-15

Population of Study Area Including Tijuana (thousands)

	1975	1980	1990
San Diego County Study Area	1259.2	1403.9	1772.1
Tijuana, Baja California	470.5-522.2*	609.7-728.7	992.9-1418.2
Total	1729.7-1781.4	2013.6-2132.6	2765.0-3190.3

*By linear interpolation of decennial estimates.

Source: Table III-5 and Table III-14

Economy

Historic Trends

The structure of the San Diego regional economy has changed significantly over the past 25 years. While the top four employment sectors - trade (including both wholesale and retail), government, manufacturing and services - have remained the same throughout the quarter century, they have changed in importance relative to each other.

In 1950, trade and government employed the largest proportions of the region's nonagricultural wage and salary workers, with nearly 25% in each of the two sectors. During the ensuing seven years, though, the nation's need for planes to fight the war in Korea and the existence of aircraft production facilities in San Diego propelled the manufacturing sector to employment dominance. In 1955, 24.5% of the region's nonagricultural workers were employed in manufacturing, with over 74% of those in aircraft and ordnance industries.

By the early 1960's, the aircraft industry in the region had begun to decline. This trend reflected the shift in military strategy from bombers to guided missiles. While the electronic equipment and supply industries started to grow in response to the need for new types of sophisticated electronic equipment, they could not completely offset the decrease in aircraft employment.

At about the same time, though, new forces emerged to sustain the region's economic growth. Government employment was one: by 1965, it was the largest civilian employer, with just over 25% of the working labor force. Tourism was another: by 1965, trade and services had become the second and third largest employment sectors. Their rapid growth at that time indicated that San Diego's economy had reached a size which made feasible the local production of goods and services that had previously been imported.

The historic pattern of nonagricultural employment in San Diego County is shown in Table III-16.

Projections

Forecasts of regional economic growth indicate a continuation of the rapid expansion experienced over the past quarter century. Overall employment is expected to increase at an average annual rate of 2.7% between 1973 and 2000, reaching a level of more than one million by the latter date.

The fastest growing sector is expected to be services, with average annual employment growth of 3.9%. At that rate, service employment will triple by the end of the century and will surpass all other sectors by then. Other rapidly growing industries, as shown in Table III-17, will be finance (annual growth of 3.3%) and trade (2.7%). Transportation and utilities (2.6%) and manufacturing (2.5%) are expected to grow at a slightly slower rate than overall employment (2.7%). Among the more slowly growing sectors are government (2.3%) and construction (1.5%). Agricultural employment is expected to experience little change.

TABLE III-16

Wage and Salary Workers in Nonagricultural Establishments
San Diego County
(thousands)

	1950[1]	1955[1]	1960[1]	1965[1]	1970[2]	1974[2]
Total	132.3	187.6	260.1	272.1	387.1	460.3
Mineral Extraction	0.2	0.2	0.6	0.4	0.5	0.6
Construction	10.1	13.5	19.2	15.6	21.3	27.6
Manufacturing	24.7	46.0	67.8	49.9	67.4	71.2
Aircraft & Parts, Ordnance	14.8	34.1	48.2	25.9		
Electrical Equipment & Supply	0.3	0.9	3.7	5.2		
Transportation & Utilities	8.2	11.0	13.8	15.0	20.5	23.3
Trade	32.5	42.3	52.8	59.8	86.1	100.1
Wholesale	5.9	7.3	8.8	9.9	13.0	15.4
Retail	26.6	35.0	44.0	49.9	73.1	84.7
Finance, Insurance, Real Estate	4.5	7.3	10.8	12.9	17.9	24.4
Services	19.5	24.2	38.5	50.1	75.5	94.3
Government	32.6	43.2	56.6	68.4	97.9	118.8

[1] Source: California Statistical Yearbook 1970, Table C-9.

[2] Source: Lowry Associates, San Diego Metropolitan Facilities Plan, 1975-2000, page 2-172.

TABLE III-17

Civilian Employment Forecasts for Major Industries, San Diego Region 1973-2000

Industry	Civilian Employment (000s) 1973	1980	1990	2000	% of Total 1973	2000	Average Annual Rate of Growth Percent
Agriculture	10.2	10.5	10.8	11.2	2.1	1.1	.3
Mineral Extraction	.5	.6	.7	.8	.1	.1	1.7
Construction	24.5	28.3	31.9	36.5	5.0	3.6	1.5
Manufacturing	63.7	77.3	99.3	125.8	12.9	12.3	2.5
Transportation, Communications	22.6	27.8	36.1	45.8	4.6	4.5	2.6
Trade	96.3	119.2	156.0	199.5	19.6	19.6	2.7
Finance, Insurance & Real Estate	23.3	30.1	41.7	56.4	4.7	5.5	3.3
Services	87.1	118.4	174.1	248.7	17.7	24.4	3.9
Government	113.8	132.7	169.3	211.4	23.1	20.8	2.3
Other	50.1	57.7	69.6	82.1	10.2	8.1	1.8
TOTAL	492.1	602.5	789.5	1018.3	100%	100%	2.7

Source: Economic Research Bureau of San Diego
San Diego Chamber of Commerce

San Diego's Economic Link to Tijuana

San Diego is economically linked to Tijuana through industry, commerce and tourism. About 5,000 Mexicans work in "twin plant" industries where a Mexican firm provides semi-skilled labor for a U.S. affiliate. In 1968, commerce with Mexican nationals was estimated at approximately $94.5 million. Border crossings continue to increase for business and tourism.

Land Use

Existing Pattern

Urban Development. Urbanization in the study area, as in the county, is concentrated in the western portion. The subareas centered around Central San Diego have the largest proportions of developed land. Those areas at the periphery are less developed. Generalized land use is shown in Figure III-4.

Figure III - 4

See map inserted inside of rear cover

The most developed subareas are La Mesa, Lemon Grove and National City. These areas have more than 80% of their land areas developed. La Mesa and Lemon Grove are overwhelmingly residential (66% and 68%, respectively), with some local-serving uses (approximately 14% each). National City has less residential (45%) but has significant amounts of basic and local-serving development (about 15% of each).

Areas that are between 70% and 80% developed complete the most urbanized group. They include Central San Diego, Peninsula, Mid-City and Chula Vista. These areas have between 39% (Peninsula) and 60% (Mid-City) residential use. Peninsula has the highest proportion of basic development (14%) and Mid-City the least (2.9%); Central has the highest proportion of local-serving development (18%) with Chula Vista and Mid-City the least (13%).

The next most developed subareas are adjacent to the core group described above but not to each other. They are those with between 50% and 70% of their land developed and include Coronado, Southeast San Diego, Coastal, Kearny-Mesa and El Cajon. Southeast has more than half of its total area devoted to existing residential use, while El Cajon and Coastal are close to the 50% level. Coronado has the highest proportion of land in the total study area - 32% - developed into basic use.

The least developed subareas in the study are those generally around the northern and eastern perimeter and include North San Diego, Miramar, Poway, Lakeside, Harbison-Crest, Alpine, Jamul and Sweetwater. These areas are less than 10% developed. Jamul is the least developed (less than 2%). The amount of development and acreage available for urbanization for each subarea are shown in Table III-18.

Housing. Housing estimates made for San Diego County in 1974 indicated a total of 565,560 existing dwelling units. This level represents an increase of nearly 120,000 units (over 25%) since the 1970 Census, when the county total was 450,800 units.

CPO estimated the number of households in the study area in 1975 at 437,500. CPO does not estimate or forecast the number of housing units in the study area. Therefore, "households" have been used as an approximation. The actual number of housing units would be slightly larger because of vacancies.

The proportion of single-family units in the county as a whole has been slowly declining since 1970. In that year, single-family dwellings comprised 67.6% of the total housing units; multi-family dwellings were 27.6% and mobile homes 4.8%. By 1974, these proportions had change: 62.4% of the total were single-family units, 32% were multi-family, and 5.6% were mobile homes. CPO estimated, in 1975, that 66.6% of the western portion of the county and 65.4% of the study area households were living in single-family units.

TABLE III-18

1975 Land Use
(Thousands of Acres)

		Total Acres	Developed Acres	Vacant Acres	Constrained Acres	Acres Available for Urbanization
1	Central San Diego	10.5	8.2	2.3	2.1	0.2
2	Peninsula	8.3	6.2	2.1	2.0	0.1
3	Coronado	5.6	3.5	2.1	1.9	0.2
4	National City	4.7	3.8	0.9	0.5	0.2
5	Southeast San Diego	12.1	7.6	4.4	0.7	3.7
6	Mid-City	10.2	8.0	2.2	1.9	0.3
10	Kearny-Mesa	20.1	13.6	6.5	3.1	1.5
11	Coastal	11.7	6.9	4.8	3.9	0.6
12	University	8.1	2.7	5.3	2.0	2.6
13	Delmar-Mira Mesa	29.1	4.3	24.8	8.1	5.1
14	North San Diego	31.4	2.7	28.7	11.1	3.3
15	Poway	35.9	3.2	32.7	15.4	5.9
16	Miramar	7.7	0.3	7.4	7.4	0.0
17	Elliot-Navajo	38.9	6.4	32.5	25.2	3.4
20	Sweetwater	27.1	2.6	24.5	4.5	3.2
21	Chula Vista	9.5	7.2	2.3	1.1	0.7
22	South Bay	29.0	6.6	22.4	8.2	1.1
30	Jamul	65.2	1.1	64.1	44.9	0.0
31	Spring Valley	12.0	5.2	6.8	2.1	3.7
32	Lemon Grove	2.8	2.4	0.4	0.1	0.4
33	La Mesa	6.5	5.7	0.8	0.4	0.3
34	El Cajon	16.0	10.5	5.5	2.0	2.5
35	Santee	9.6	3.2	6.4	3.2	2.0
36	Lakeside	48.6	5.6	43.0	33.0	2.4
37	Harbison-Crest	20.8	2.5	18.2	7.3	0.2
38	Alpine	17.0	1.9	15.0	5.3	0.2
	TOTAL	498.4	131.9	366.1	197.4	43.8

Source: Comprehensive Planning Organization of the San Diego Region, February 1977, Preliminary Series IV Forecasts by Subregional Areas 1975-95.

The age of the housing stock in San Diego County is given in Table III-19. At the time of the 1970 census, nearly 70% of all housing in the county had been built since 1949. Another 32% was between 20 and 30 years old, and 16.7% was more than 30 years old.

TABLE III-19

Age of Housing in City of San Diego and San Diego County, 1970 Census

Year Structure Built	San Diego County		San Diego City	
	Number	Percent	Number	Percent
Year-Round Housing Units	449,738		240,934	
1969 to March 1970	33,366	7.4	17,352	7.2
1965 to 1968	54,354	12.1	24,963	10.4
1960 to 1964	78,441	17.4	35,934	14.9
1950 to 1959	145,453	32.3	74,702	31.0
1940 to 1949	62,827	14.0	35,662	14.8
1939 or earlier	75,297	16.7	52,323	21.7

Source: U. S. Bureau of the Census, Census of Population and Housing: 1970, Census Tracts, Final Report PHC(1)-188, San Diego, California, SMSA.

Land Use Forecast

The CPO Model. CPO's urban development model (PLUM) uses some land use assumptions as inputs in forecasting the level and distribution of population growth and urbanization. As discussed in the population section, PLUM combines information about basic employment, availability of residential land, and travel time between traffic zones to estimate future conditions.

In developing the required inputs, CPO allocated basic employment for 1985 and 1995 among five major statistical areas in the county. The allocation was based on historical trends, planned industrial sites, and the availability of vacant land, with adjustments where special known circumstances warranted them. The employment was then distributed to specific sites in the various statistical areas. The distribution indicated that, over the forecast period, the central and southern areas' shares of total basic employment will decrease, the northern areas' shares will increase, and the eastern areas' shares will remain substantially unchanged. Finally, the land required to accommodate expected basic employment increments was estimated and put into the model.

The model is also fed information on areas constrained from development so that its forecast will not include them among the available land. Such constrained areas include flood plains and floodways, steep slopes, agricultural preserves, proposed regional parks, military lands, Indian reservations, and several other minor categories. These lands totalled 197,400 acres within the study area in 1975. Agricultural preserves were assumed to remain undevelopable throughout the forecast period.

Forecast. The Series IV forecast shows an intensification of development throughout the study area. All subareas are expected to use up their remaining vacant land available for urbanization. All but seven are, in addition, expected to develop some of their vacant lands available for nonresidential development or rural development only, or both. Rural development, in this case, means development on land to which urban services may not be extended by 1995, necessitating much lower densities than for urban development. The Series IV land use projections for the study area are summarized in Table III-20.

Specifically, Del Mar-Mira Mesa, Sweetwater, Poway and North San Diego are expected to experience the most extensive development during the 20-year forecast period. If CPO projections are accurate, Del Mar-Mira Mesa will have 9,100 acres developing, Sweetwater will have 9,000 acres developing, Poway will have 7,900 acres and North San Diego will have 6,800 acres. The smallest amounts of growth will occur in Peninsula, Miramar (100 acres each), Central San Diego and Coronado (200 acres each).

The Series IV forecast also projects and distributes increases in developed residential acreage. (This distribution is, of course, associated with the population data described earlier.) According to the forecast, two areas - Central San Diego and Mid-City - will show decreases in their amounts of residential acreage between 1975 and 1995. The largest acreage gains are expected in Sweetwater (8,400 acres), Del Mar-Mira Mesa (8,000 acres), and Poway (7,100 acres). Residential land use change by subarea is summarized in Table III-21.

TABLE III-20

Projected Land Use
(thousands of acres)

Subarea	Total Acreage	Total Unconstrained	Developed 1975	1980	1985	1990	1995
1 Central San Diego	10.5	8.4	8.2	8.3	8.4	8.4	8.4
2 Peninsula	8.3	6.3	6.2	6.3	6.3	6.3	6.3
3 Coronado	5.6	3.7	3.5	3.6	3.7	3.7	3.7
4 National City	4.7	4.2	3.8	4.0	4.1	4.1	4.2
5 Southeast San Diego	12.1	11.4	7.6	9.1	10.5	10.5	11.4
6 Mid-City	10.2	8.3	8.0	8.2	8.3	8.3	8.3
10 Kearny-Mesa	20.1	17.0	13.6	14.4	15.2	15.3	15.5
11 Coastal	11.7	7.8	6.9	7.2	7.5	7.5	7.5
12 University	8.1	6.1	2.7	3.6	4.5	4.7	4.8
13 Del Mar-Mira Mesa	29.1	21.0	4.3	6.1	8.0	10.9	13.4
14 North San Diego	31.4	20.3	2.7	4.0	5.3	7.6	9.5
15 Poway	35.9	20.5	3.2	4.4	5.6	8.5	11.0
16 Miramar	7.7	0.3	0.3	0.3	0.4	0.4	0.4
17 Elliot-Navajo	38.9	13.7	6.4	8.2	10.0	10.4	10.6
20 Sweetwater	27.1	22.6	2.6	3.6	4.7	8.4	11.6
21 Chula Vista	9.5	8.4	7.2	7.7	8.1	8.2	8.4
22 South Bay	29.0	20.8	6.6	7.3	8.1	9.2	10.2
30 Jamul	65.2	20.3	1.1	1.3	1.4	2.7	3.7
31 Spring Valley	12.0	9.9	5.2	6.6	8.2	8.8	9.4
32 Lemon Grove	2.8	2.7	2.4	2.6	2.8	2.8	2.8
33 La Mesa	6.5	6.1	5.7	5.9	6.0	6.0	6.0
34 El Cajon	16.0	14.0	10.5	11.4	12.4	13.1	13.7
35 Santee	9.6	6.3	3.2	3.9	4.5	5.0	5.6
36 Lakeside	48.6	15.6	5.6	6.2	6.9	7.7	8.4
37 Harbison-Crest	20.8	13.5	2.5	2.7	2.8	3.6	4.2
38 Alpine	17.0	11.7	1.9	2.0	2.1	2.1	2.2
TOTAL	498.4	300.9	131.9	148.9	165.8	184.2	201.2

Source: Comprehensive Planning Organization of the San Diego Region, February 1977, Preliminary Series IV Forecasts by Subregional Areas 1975-95.

TABLE III-21

Forecast Residential Land Use Change
(thousands of acres)

Subarea	1975	1995	Change
1 Central San Diego	4.8	4.6	-0.2
2 Peninsula	3.2	3.2	0.0
3 Coronado	0.9	1.1	0.1
4 National City	2.1	2.1	0.0
5 Southeast San Diego	6.3	9.1	2.8
6 Mid-City	6.1	5.8	-0.3
10 Kearny-Mesa	7.5	8.3	0.8
11 Coastal	5.6	5.9	0.3
12 University	1.3	2.8	1.5
13 Del Mar-Mira Mesa	3.0	11.0	8.0
14 North San Diego	1.8	7.7	5.9
15 Poway	2.6	9.7	7.1
16 Miramar	0.0	0.0	0.0
17 Elliot-Navajo	4.7	8.5	3.8
20 Sweetwater	1.9	10.2	8.4
21 Chula Vista	5.0	5.4	0.3
22 South Bay	3.3	6.1	2.9
30 Jamul	0.9	3.5	2.6
31 Spring Valley	4.3	7.9	3.6
32 Lemon Grove	1.9	2.1	0.1
33 La Mesa	4.3	4.3	0.0
34 El Cajon	7.9	10.2	2.3
35 Santee	2.4	4.3	1.8
36 Lakeside	4.7	7.3	2.6
37 Harbison-Crest	2.4	4.0	1.6
38 Alpine	1.8	2.0	0.2
TOTAL	90.7	147.1	56.4

Source: Comprehensive Planning Organization of the San Diego Region, February 1977, Preliminary Series IV Forecasts by Subregional Areas 1975-95.

Housing. Notwithstanding residential acreage losses in some subareas, CPO forecasts increased numbers of occupied housing units in all areas. In all, 282,800 additional dwelling units are expected to be occupied during the two decades. Largest gains are anticipated in Sweetwater (30,200 units), Del Mar-Mira Mesa (29,800 units) and Poway (25,400). Even the areas expected to lose residential acreage - Central San Diego and Mid-City - are expected to gain 15,400 and 6,000 units, respectively, which means that densities in those areas will increase (compare Tables III-4 and III-8). Smallest increases are projected for Alpine (1,400 units) and National City (1,800 units), while only Miramar will see no change. The CPO forecast is summarized in Table III-22.

CPO does not estimate the future mix of single-family and multi-family dwelling units.

TABLE III-22

Forecast Housing Unit Change
(thousands)

Subarea	1975	1995	Change
1 Central San Diego	51.7	67.1	15.4
2 Peninsula	21.8	24.5	2.7
3 Coronado	6.4	8.8	2.4
4 National City	13.3	15.1	1.8
5 Southeast San Diego	24.9	37.3	12.4
6 Mid-City	44.5	50.6	6.1
10 Kearny-Mesa	43.0	49.0	6.0
11 Coastal	32.6	38.8	6.2
12 University	6.3	23.5	17.2
13 Del Mar-Mira Mesa	11.3	41.2	29.9
14 North San Diego	7.2	27.2	20.0
15 Poway	9.3	34.7	25.4
16 Miramar	0.2	0.2	0.0
17 Elliot-Navajo	20.5	36.5	16.0
20 Sweetwater	5.2	35.4	30.2
21 Chula Vista	29.5	38.4	8.9
22 South Bay	18.7	29.6	10.9
30 Jamul	1.3	6.2	4.9
31 Spring Valley	11.4	25.3	13.9
32 Lemon Grove	7.4	9.9	2.5
33 La Mesa	19.2	23.2	4.0
34 El Cajon	27.4	43.3	15.9
35 Santee	10.4	19.6	9.2
36 Lakeside	9.7	23.8	14.1
37 Harbison-Crest	2.6	8.1	5.5
38 Alpine	1.7	3.1	1.4
TOTAL	437.5	720.4	282.9

Source: Comprehensive Planning Organization of the San Diego Region, Febrary 1977, Preliminary Series IV Forecasts by Subregional Areas 1975-95.

Agriculture

As more and more land has been developed for urban uses, the amount of land in agricultural use has declined. In the San Diego region, agricultural operations have moved from their original locations to other sites within the metropolitan area, within the county, and even outside the county.

In 1950, nearly 70,000 acres were in agricultural use. With the exception of the Camp Elliott area to the northeast of the City of San Diego, agricultural land use generally formed a broad swath comprised of irregularly shaped and spaced parcels to the north, east and south of the urbanized area. By 1958, though, there was nearly 60% less land in agricultural use; total farming area had decreased to approximately 29,000 acres as the relatively low return per acre made it difficult for field crops to resist the pressure for urban development. Vegetable crops replaced some of the field crops in the South Bay area. In the northwest portion of the metropolitan area - just east of Cardiff, Leucadia and Encinitas - the acreage devoted to nursery products and commercial flower production increased.

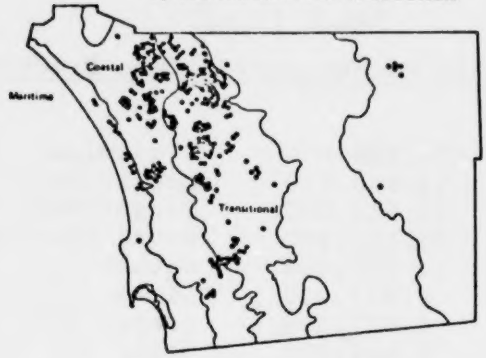
Between 1958 and 1966, agricultural acreage decreased again to about 21,600 acres; this moderate decline was marked by important changes in its distribution. The northern metropolitan area had become the main center of agricultural activity: the nursery and commercial flower acreage east of Cardiff, Leucadia and Encinitas had increased further and the San Pasqual Valley had become agriculturally prominent, growing field crops such as beans, potatoes and corn for ensilage. The agricultural areas in Mission Valley and the southeastern part of the City of San Diego had virtually disappeared.

Agricultural production is dependent on a favorable climate, good soil and adequate water. The unique combination of these factors occurs only within limited areas. In coastal San Diego County, the climate is excellent, but the soils are not universally suitable and water is relatively expensive. However, because the climate is so advantageous to specific crop production, the other factors can be manipulated successfully to take advantage of the unique climatic situation.

Crop production plotted on maps showing area climates illustrates that agriculture is concentrated within the marine-influenced climate zones, as shown in Figures III-5(a) to III-5(e). These production sites typically are supplied with imported water through service from one of the agencies within the San Diego County Water Authority area.

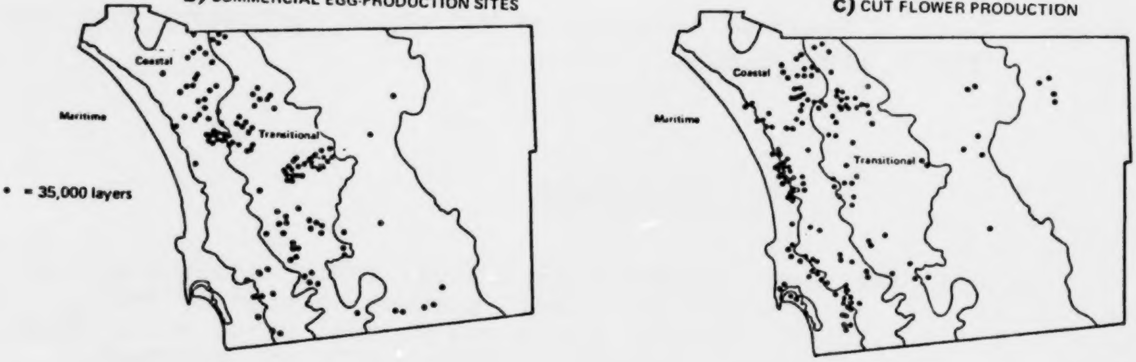
The gross value of the most important commodities in 1976 are shown in Table III-23.

a) SUBTROPICAL FRUIT PRODUCTION



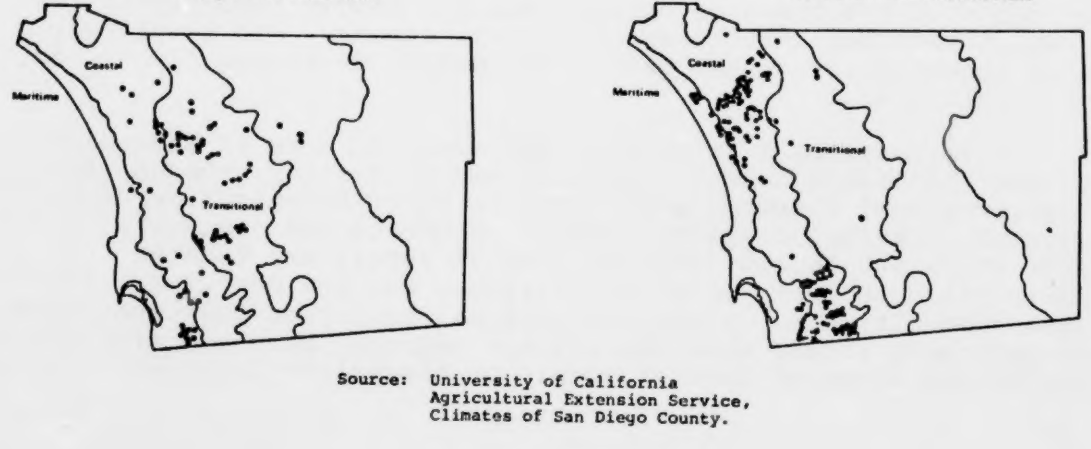
b) COMMERCIAL EGG-PRODUCTION SITES

c) CUT FLOWER PRODUCTION



d) DAIRY LOCATIONS

e) VEGETABLE PRODUCTION



Source: University of California
Agricultural Extension Service,
Climates of San Diego County.

FIGURE III-5

TABLE III-23

1976 San Diego County Agriculture Production

Tomatoes	$55,886,000	Gladiolus	$2,427,000
Eggs	54,880,000	Cauliflower	2,284,000
Avocados	42,042,000	Tangerines, Tangelos	1,909,000
Milk	25,190,000	Naval Oranges	1,663,000
Valencia Oranges	17,525,000	Squash	1,660,000
Lemons	9,031,000	Limes	1,608,000
Strawberries	8,524,000	Grapefruit	1,362,000
Carnations	6,664,000	Grain Hay	1,175,000
Beef Cattle	6,372,000	Barley (Grain)	1,170,000
Celery	3,600,000	Cherry Tomatoes	1,162,000
Cucumbers	2,695,000	Rabbits	1,036,000

Source: County of San Diego, Department of Agriculture, Agricultural Crop and Natural Resources Report, 1976

Recreation

The Regional Parks Implementation Study (RPIS) adopted by CPO in December 1972 and the CPO Open Space Element Adopted by CPO in January 1974 include 35 regional parks and several state parks (Figure III-6). The parks are intended to serve different purposes, including general recreation, water orientation and ecological preservation. It is desirable to make at least one type of park reasonably available to every resident.

The RPIS defined regional parks as those located to utilize or protect a resource serving residents of the entire region, and defined such resources as natural beauty, unique topographic features, historical structures or unusual scenery. To complement these resources, regional parks are usually developed for two outdoor activities.

A regional park is usually 200 acres or more in area with at least 50 usable acres. The size may be smaller, though, for unique regional resource parks such as Quail Botanical Gardens. Regional parks are distinct from neighborhood and community parks which are usually smaller than 50 acres, are located specifically to serve local populations, and are geared for intense community use. State and national parks, on the other hand, are generally larger than the average regional park and are developed around areas of greater scenic or historical interest.

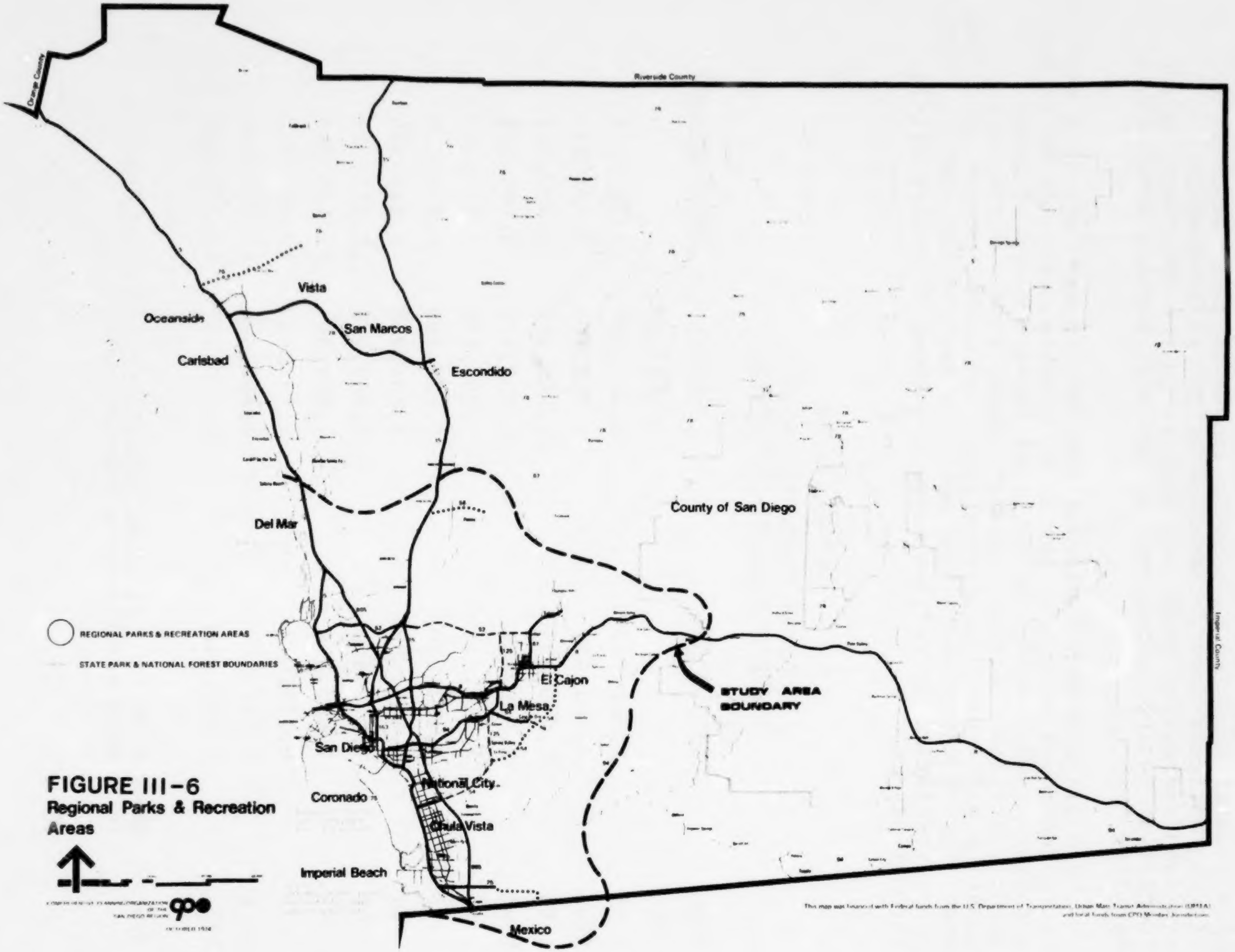


FIGURE III-6
Regional Parks & Recreation Areas

This map was financed with Federal funds from the U.S. Department of Transportation, Urban Mass Transit Administration (UMTA) and local funds from CPO Member Jurisdictions.

In the San Diego Region, beaches must be considered as a special recreation resource. Inland areas of California depend upon coastal counties to provide access to these beaches. A Citizen Attitude Survey conducted by CPO in 1970 which examined recreation needs and desires in the San Diego region identified "going to beaches" as the most popular recreational activity.

San Diego County residents are able to make use of a variety of recreational resources including beaches, state parks in both deserts and mountains, and national forests close to home, readily available within 2 hours' travel time. Given this quantity and variety of recreational resources, county residents spend 92% of their recreation activity days in the region. Attendance statistics at various areas are shown in Tables III-24 through III-26.

TABLE III-24

Annual Beach Attendance
(Number of Beach Visits)

Year	City of San Diego	Other	Total Region
1960		2,106,045	
1961	1,312,787	2,210,249	3,523,036
1962	2,653,035	1,004,153	3,657,188
1963	3,290,933	1,180,023	4,470,956
1964	2,940,254	1,039,974	3,980,228
1965	2,669,313	1,288,139	3,957,452
1966	4,472,170	2,181,965	6,654,135
1967	5,805,092	2,835,268	8,640,360
1968	7,102,402	2,969,748	10,072,150
1969	7,688,314	3,979,992	11,668,306
1970	6,742,642	3,954,930	10,697,572
1971	8,547,789	4,263,046	12,810,835
1972	8,996,482	4,330,567	13,327,049

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan EIR, 1977, based on CPO in-house coastline data files.

TABLE III-25

Visitors to Selected State Parks San Diego County

	1971-72	1972-73	1973-74	1974-75	1975-76
Anza Borrego Desert Park*	653,556	1,123,262	522,666	645,455	775,904
Cuyamaca Rancho State Park	453,068	539,739	560,647	660,084	569,718
Palomar Mountain State Park	142,815	126,788	146,898	146,539	147,080

*Partly in Imperial County.

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan EIR, 1977, based on information obtained from the California Department of Parks and Recreation

TABLE III-26

Visitors to Cleveland National Forest San Diego County Areas

Year	Number of Visitors
1971	1,030,400
1972	1,054,900
1973	1,258,700
1974	1,144,900
1975	1,137,100

Source: Cleveland National Forest

Circulation/Transportation

Circulation: Traffic

The existing regional highway system consists of 245 miles of freeways and 830 miles of regionally significant arterials. (The 1975 freeway system is shown in Figure III-7 and the regionally significant arterial system is shown in Figure III-8.) The arterial system complements the freeway system in providing regional transportation service; it includes 330 miles under state jurisdiction and 500 miles under local (city and county) jurisdiction. The highway system also includes over 5,000 miles of locally maintained collector and distributor-type arterial streets, which primarily serve intracommunity needs and provide local access service.

Trip Characteristics. Vehicle trips are categorized into five general types, identified below. The purpose and nature of the trips, their average lengths, and relative importance to the total area traveled are estimated by CPO and CALTRANS to be:

Trip Purpose	Average Length in Miles (One Way)	% of Area's VMT
Home to work	9.4	27
Home to shop	4.3	13
Home to other	6.8	30
Other to other	6.2	22
Work to other	6.4	8

Source: CPO and Caltrans

The diurnal fluctuation of trips is shown in Figure III-9. Because over 90% of the region's population lives in the study area, it can be conservatively assumed that about 90% of the trips within the region have one end of the trip in the service area. The trend of vehicle miles traveled in the region is given below.

Trend of Vehicle Miles Traveled in the Region

Year	Daily Vehicle Miles
1960	8,000,000
1966	12,300,000
1970	16,000,000
1975	23,000,000

Source: CPO and Caltrans

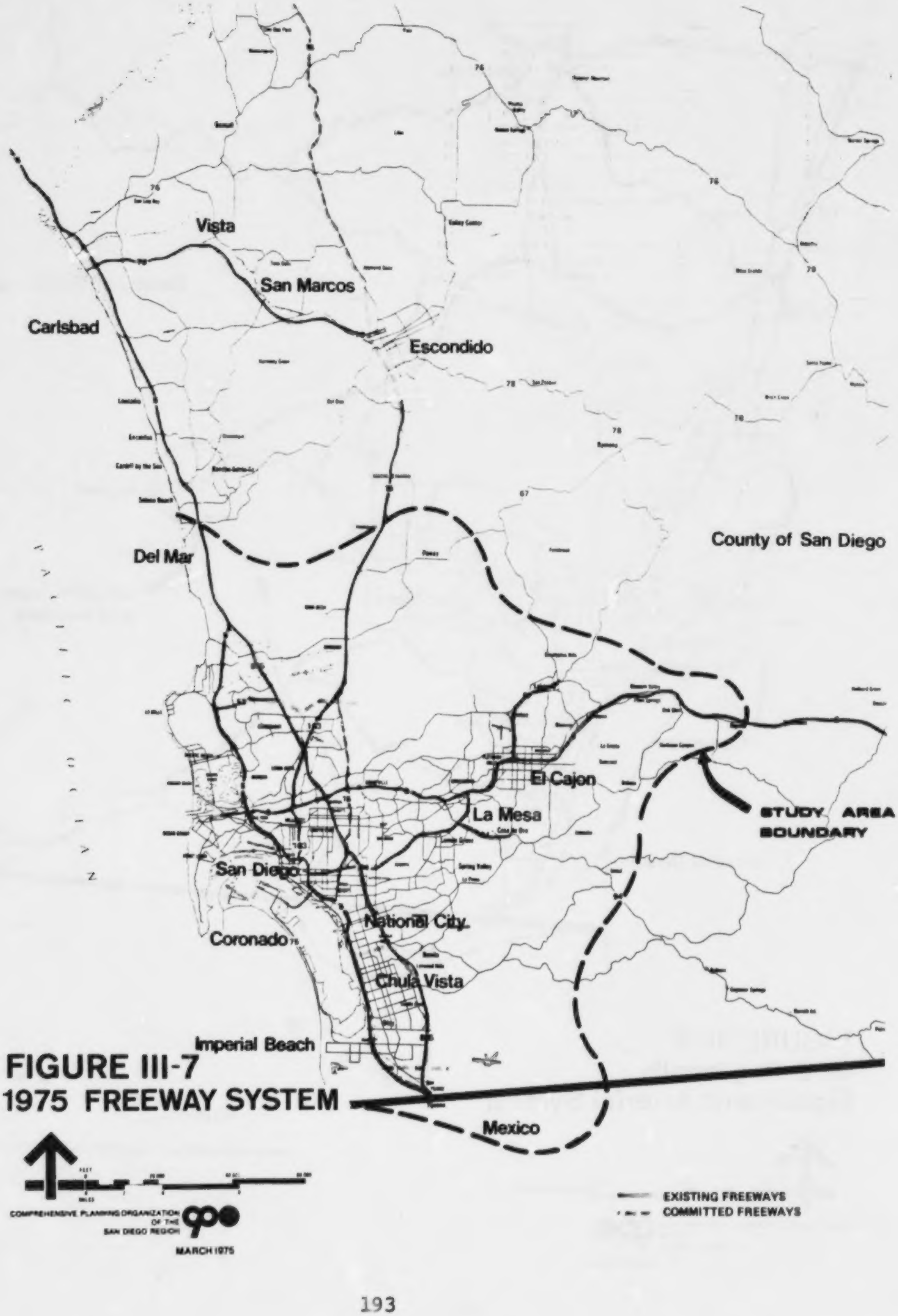


FIGURE III-7
1975 FREEWAY SYSTEM

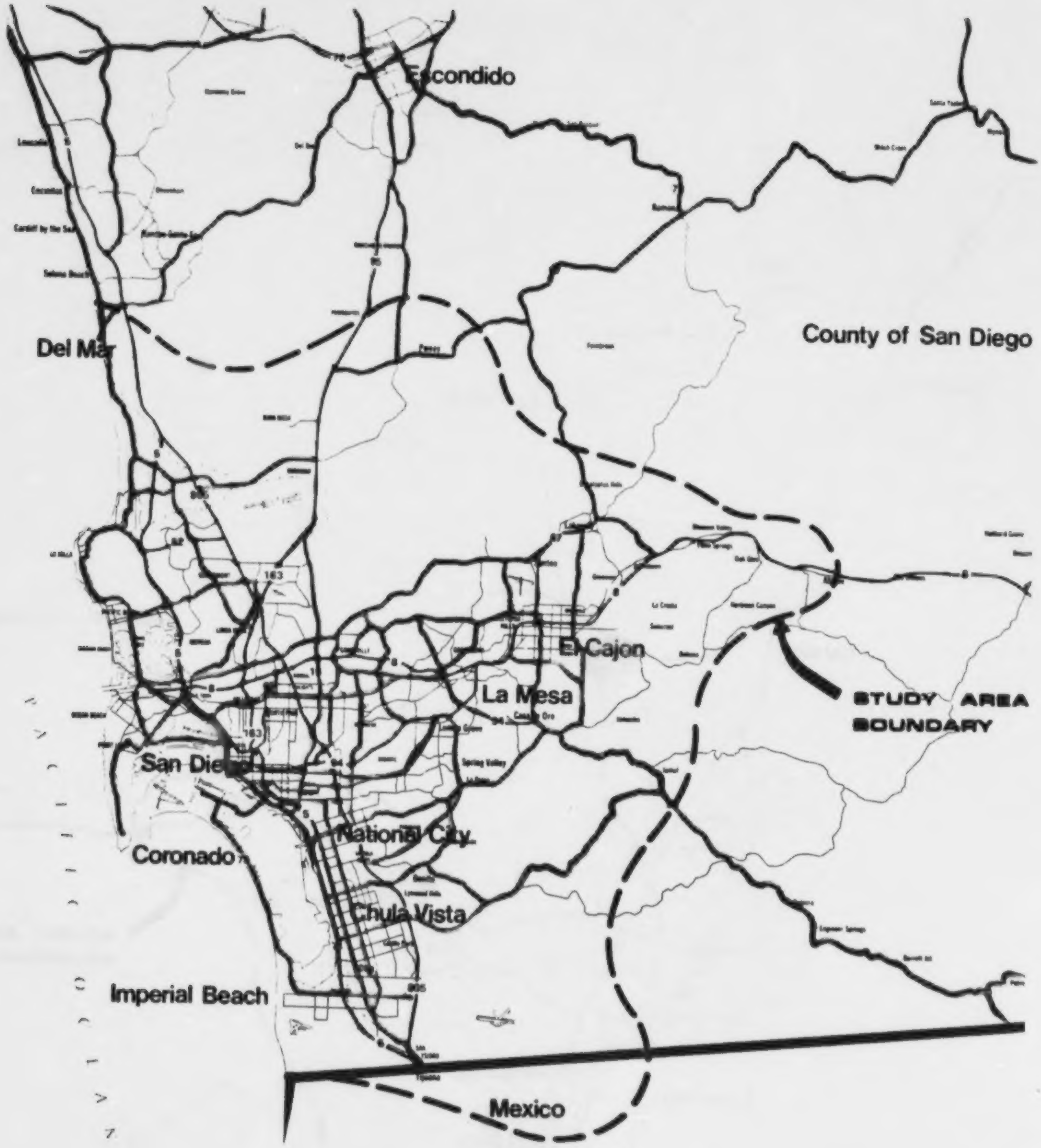


FIGURE III-8
1975 Regionally Significant Arterial System

FREEWAYS

REGIONALLY SIGNIFICANT ARTERIALS

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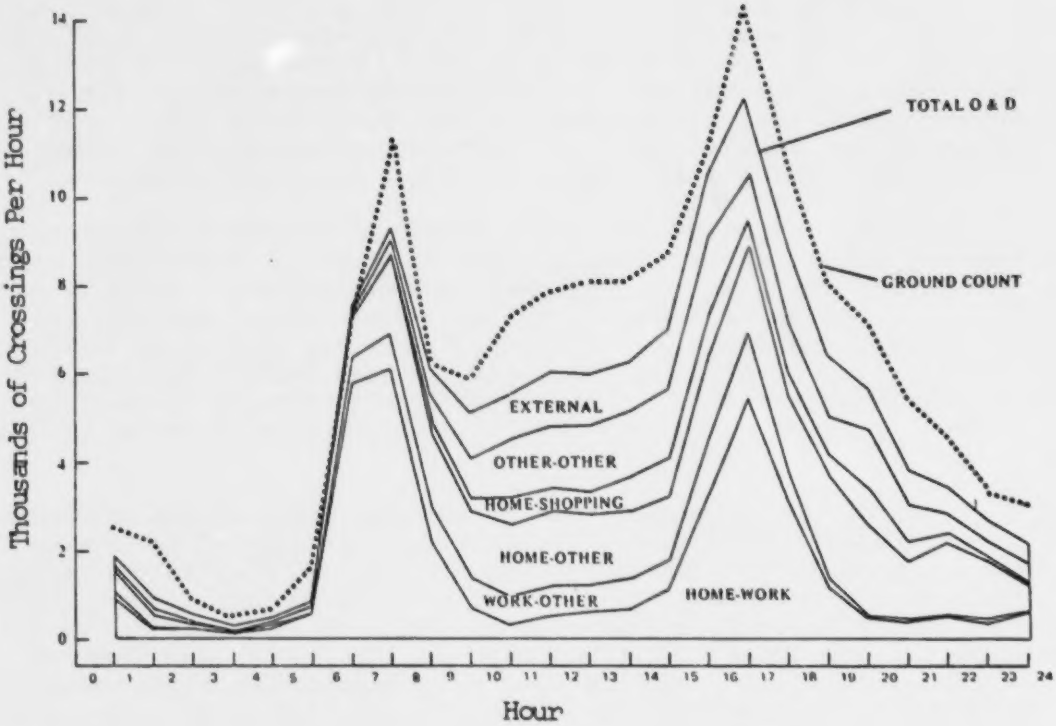


FIGURE III-9

DIURNAL FLUCTUATION OF WEEKDAY TRIPS
(From San Diego Area Transportation/Data Base-1966)
By CPO & CALTRANS

Figure III-10 shows 30-minute travel distances for various years during the period 1957 to 1970. In 1957, a motorist leaving downtown San Diego during peak traffic conditions could travel to East La Mesa in 30 minutes. In 1966, the 30-minute travel radius extended to the suburban areas of Santee and Lakeside to the east and Rancho Bernardo, Del Mar and Solana Beach to the north. By 1970, that radius extended to the peripheral communities of the service area and included Poway and Alpine.

The travel time contours outbound from downtown San Diego in 1975 during the peak period are shown in Figure III-11. About 98% of the region's population lives within 60 minutes of Centre City San Diego. Even with 22 miles of congestion on freeways, the average peak hour freeway speed is 40 to 50 miles per hour. (Centre City has been used as one point of measurement because the current freeway system functions as a radial network centered on the downtown San Diego area. The configuration of the existing system does not accommodate peripheral travel desires as effectively as trips destined to Centre City.)

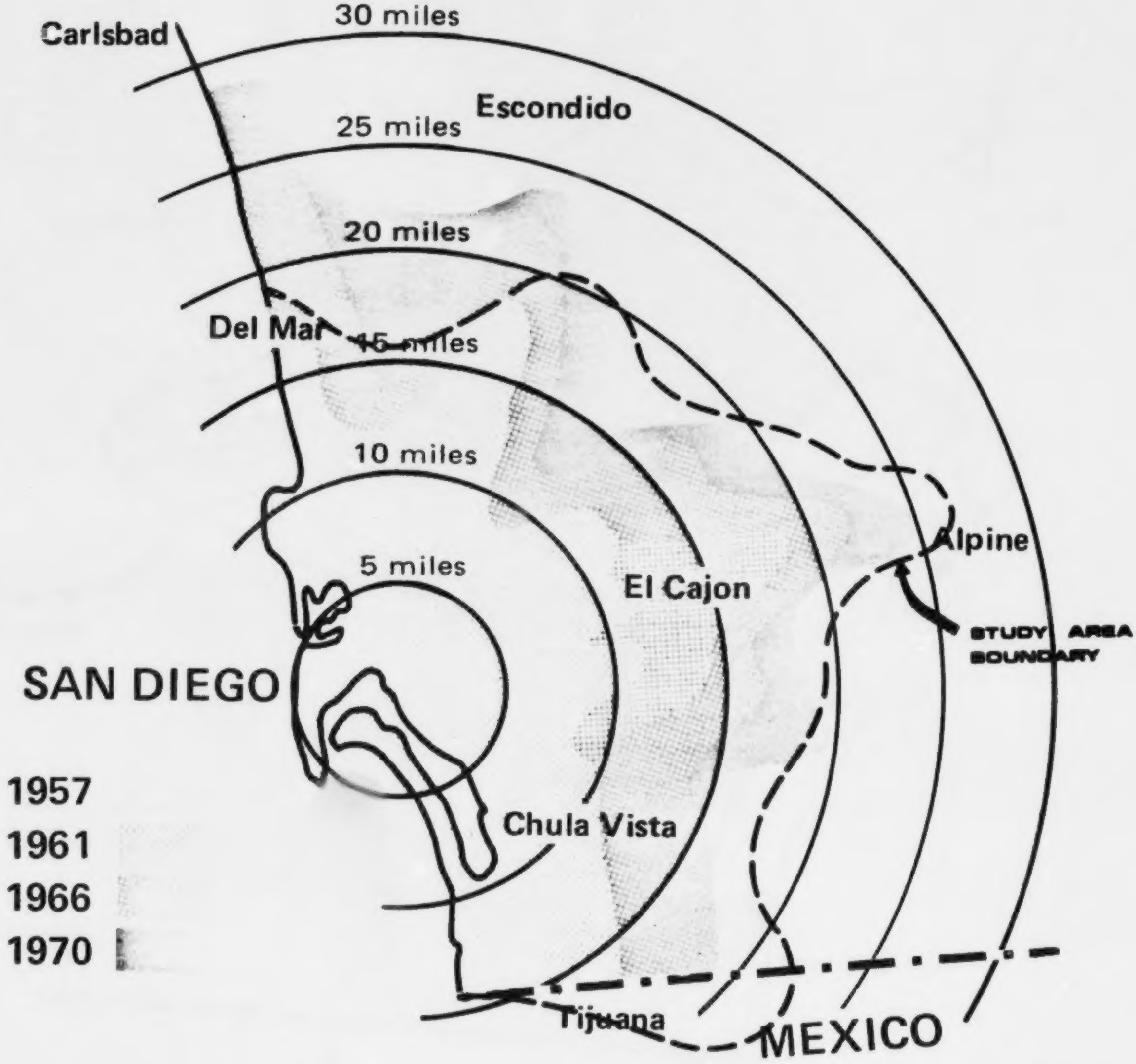
The extension of 30-minute distance contours - conversely, the reduction in travel time - can be readily associated with the construction of the regional freeway system. Route 8 was built in 1959-60. Interstate 5 was constructed between 1962 and 1969. The South Bay Freeway (Route 54) was built in 1963. Highway 163, originally completed through Balboa Park in 1945, was extended north of Miramar during 1963-69 and widened in 1973-75. Finally, Highway 805 was constructed between 1970 and 1975.

System Performance. The current highway system provides more extensive transportation service than any other transportation mode in the San Diego region. With 17 miles of freeway per 100,000 residents, the region has one of the highest levels of freeway service in the nation. Most of the resident population and employment opportunities in the region are located within 10 minutes' driving time of a regionally significant arterial. In general, the highway system today provides a high level of transportation service, both reliable and rapid, throughout the San Diego region. As a result, most of the personal travel in the region is by private automobile.

Measurements indicate that about three million vehicle trips daily are made on the highway system. With an estimated average vehicle trip length of 7.15 miles, these trips mean nearly 21 million vehicle miles of travel on the highway system. About 54% of these trips are made on the region's freeways, presumably because their full-access-control features and geometric design standards provide a higher level of service that makes travel on them more efficient than on other roads.

FIGURE III-10

30 MIN TRAVEL DISTANCES



Source: Caltrans, Travel Time Study, San Diego, California, January 1977.

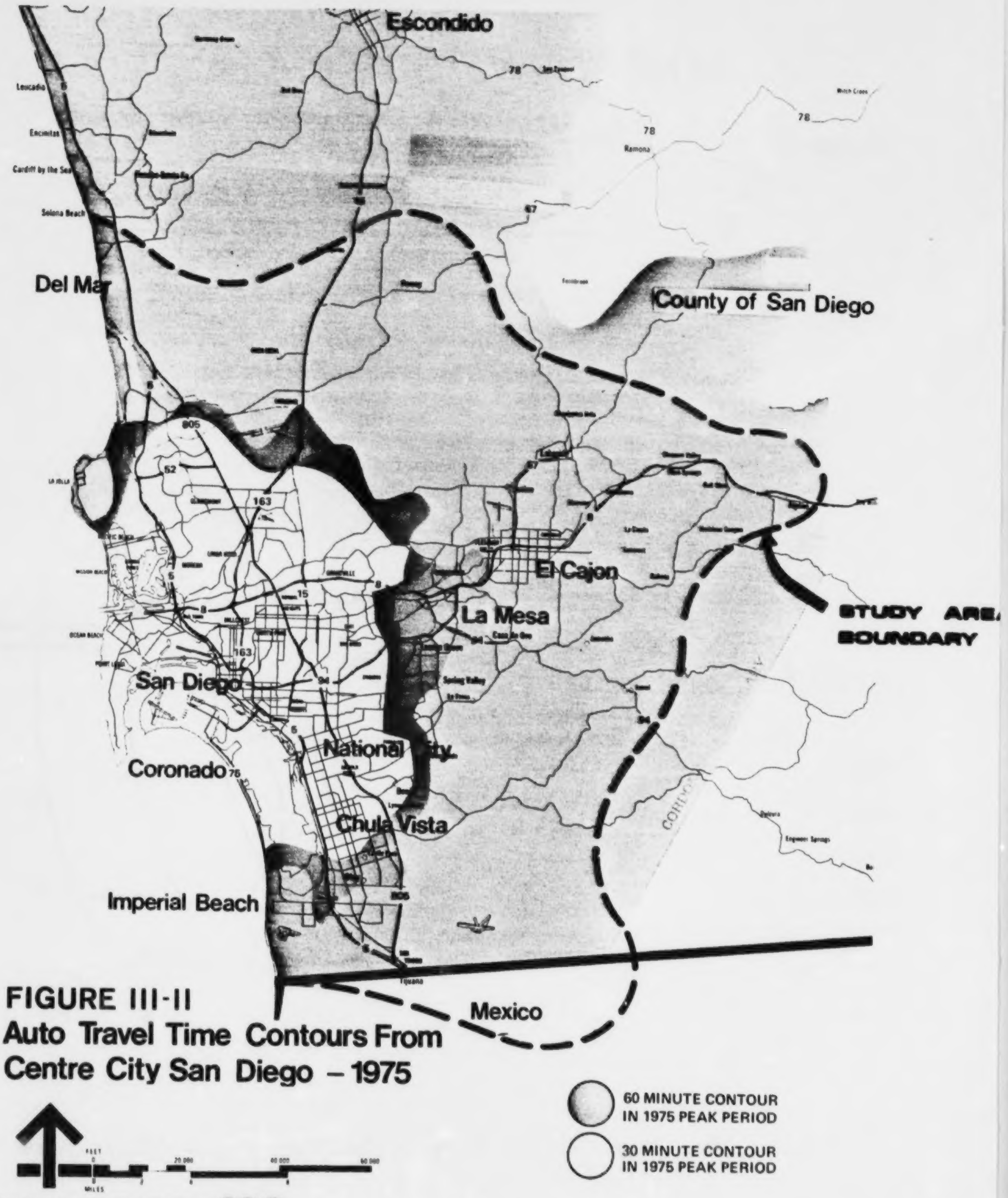


FIGURE III-II
Auto Travel Time Contours From Centre City San Diego – 1975

60 MINUTE CONTOUR IN 1975 PEAK PERIOD

30 MINUTE CONTOUR IN 1975 PEAK PERIOD

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The estimated average daily traffic (ADT) on the 1975 freeway system is shown in Figure III-12. The traffic volumes have been estimated from the 1974 traffic counts and the results of computer simulation of the 1975 freeway network, which assumed the completion of Interstate 805. Freeway volumes in the region range from 155,000 vehicles daily on Interstate 8 near Route 15 to less than 10,000 in rural areas of the county. Major arterial streets carry volumes of up to 40,000 vehicles daily. Rural roads, local streets and collectors carry volumes from several hundred to several thousand vehicles daily.

The peak demand for transportation service, particularly on weekdays from 7:00 to 9:00 a.m. and 4:30 to 6:30 p.m., does create congested conditions at certain locations where vehicle demand approaches or exceeds highway design capacity. These freeway segments are shown in Figure III-13. Almost all are within the study area for the Metropolitan Facilities Plan. With reference to the figure, "moderate" congestion can be described as a reduction in travel speeds of from 30 to 40 miles per hour for up to 30 minutes duration in the peak direction and "severe" congestion is a slowing to a stop-and-go condition for up to 1½ hours, with average speeds of 25 miles per hour or less. In contrast, during off-peak periods, speeds of 50 to 55 miles per hour are common. At present, 22 miles of freeways incur travel time delays due to congestion during peak periods.

Highway system overloading also occurs during periods of peak recreational demand, in particular at sports events at San Diego Stadium and the Sports Arena, occasionally at Del Mar Fairgrounds, and at the international border crossing into Mexico. On the whole, though, auto passengers in the San Diego region experience fewer congestion-related delays than those traveling in almost any urban area of comparable size.

The auto-highway system by itself is an incomplete transportation system because it does not fully serve persons who lack access to an automobile. Many who are disadvantaged, handicapped, or too young or too old to drive cannot take full advantage of the extensive highway network in San Diego County. These people must rely instead on others or the public transportation system which currently provides a lower level of service over a smaller portion of the region.

Transportation: Transit System

Current System. The primary public transit mode in the San Diego region is bus service. San Diego Transit Corporation (SDTC) is the largest operator in the region, carrying nearly 90% of the public transit patrons throughout the metropolitan San Diego area. Chula Vista City Transit (CVT) operates

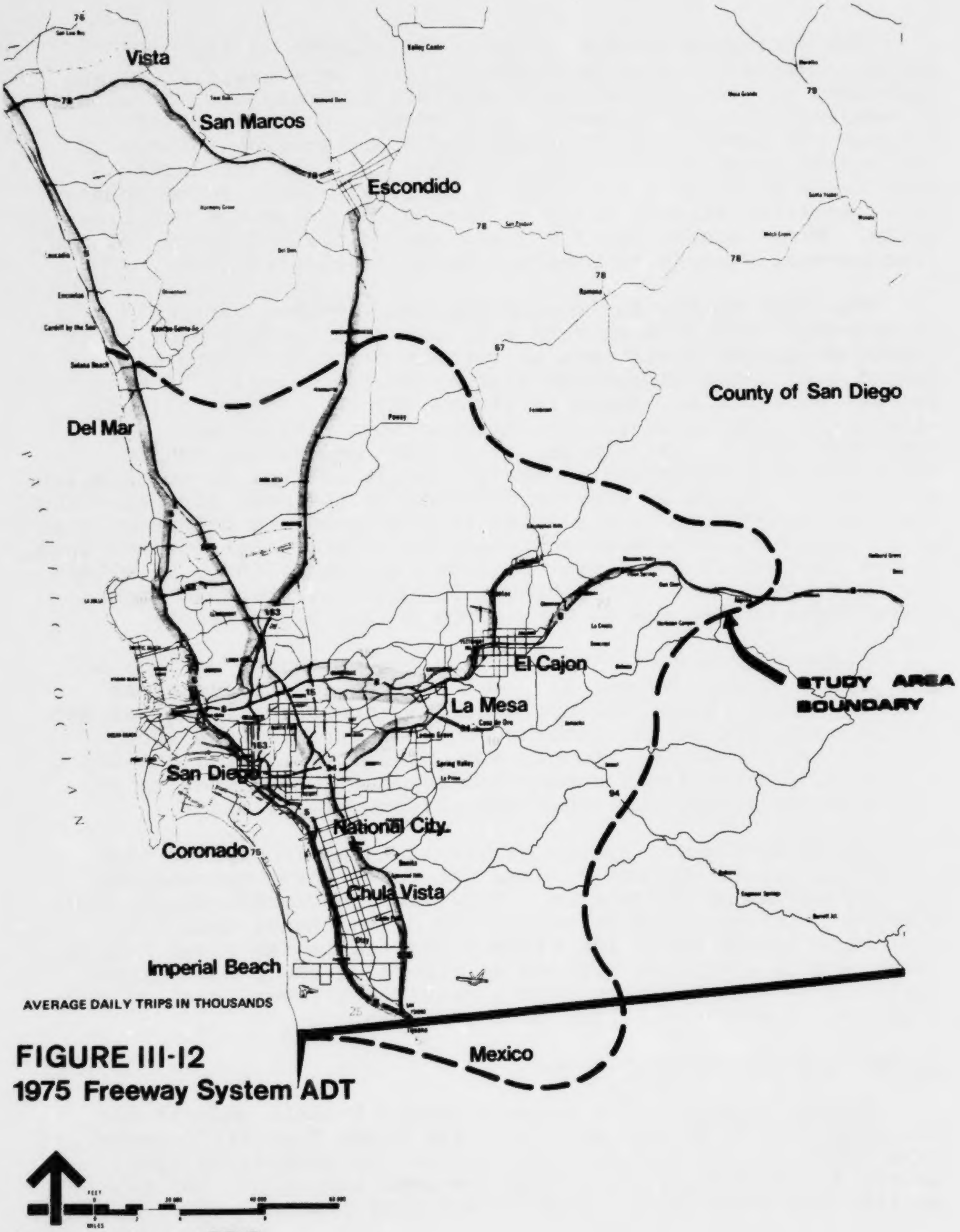

FIGURE III-12
1975 Freeway System ADT

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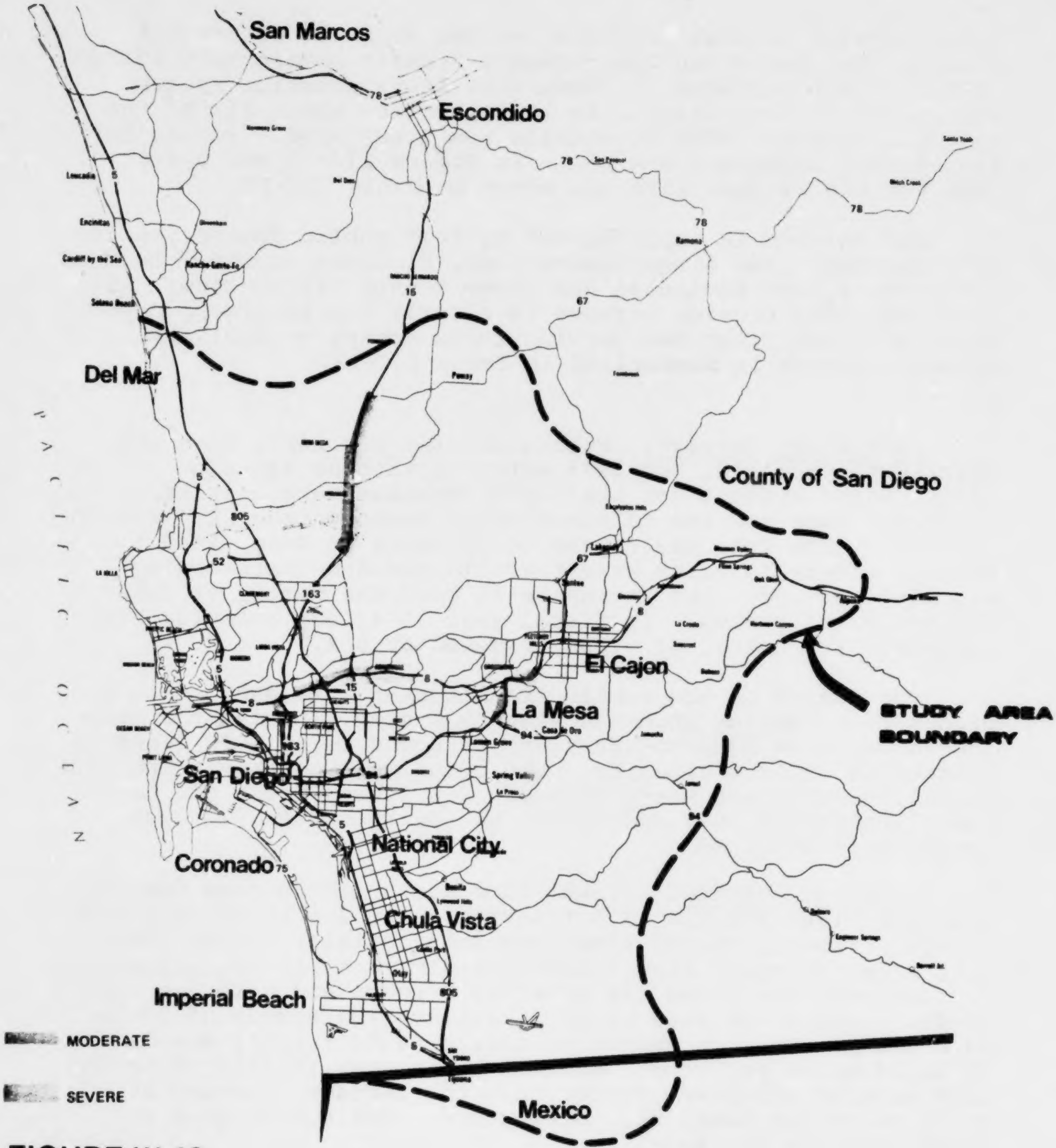

FIGURE III-13
1975 Freeway Congestion

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local service in that city and carries about 1% of transit riders. The North San Diego County Transit Development Board (NCTD), which replaced the Oceanside Transportation System and Escondido City Transit in 1976, carries about 10% of the region's riders. NCTD is outside the study area. Routes for the various operators are shown in Figure III-14 and operating data for fiscal year 1977 are shown in Table III-27.

Bus service is supplemented by four public demand-responsive systems: San Diego Dial-A-Ride, El Cajon Express, La Mesa Dial-A-Ride, and Southeast San Diego County Dial-A-Ride. All four operators provide service to elderly and handicapped persons, with San Diego DAR serving these groups exclusively. Current service is summarized in Table III-28.

Demand for Service. Public transit ridership more than doubled between 1971 and 1975 after hitting an all-time low in 1972. Major stimuli for the rapid increase were initiation of a 25-cent fare and the elimination of zones on the SDTC system in 1972. (The fare was raised to 35 cents in July, 1975.) Initial ridership gains were consolidated and increased by expanded service, with increases in both the number of buses and number of routes. In fiscal year 1974, for example, SDTC increased its number of miles traveled by 60%.

The demand on the public transit system is subject to a higher peak loading than the highway system. During the morning and evening home-to-work commute hours, many SDTC lines operate at or near capacity, with standing room only. The most heavily used routes serve downtown San Diego, while the peripheral routes of SDTC and the north county routes are less intensively utilized.

Level of Service. Travel time measurements from Centre City San Diego for the 1975 transit system are shown in Figure III-15. Transit travel times are substantially higher than auto times (compare Figure III-15 and Figure III-11) primarily because most bus lines use arterial streets and make frequent stops. Routes operated by SDTC have average speeds of 17 to 18 miles per hour, compared to average auto freeway speeds of 50 to 55 miles per hour. Express bus routes instituted in the last several years are faster than the average, running at 25 to 30 miles per hour, but local routes continue to move at about 10 miles per hour.

Another reason for high transit travel times is frequency of service, especially when a transfer from one bus to another is required to complete a trip. For most routes in the San Diego region, the service frequency is limited. Chula Vista buses run at 30- to 60-minute headways (headway is the time

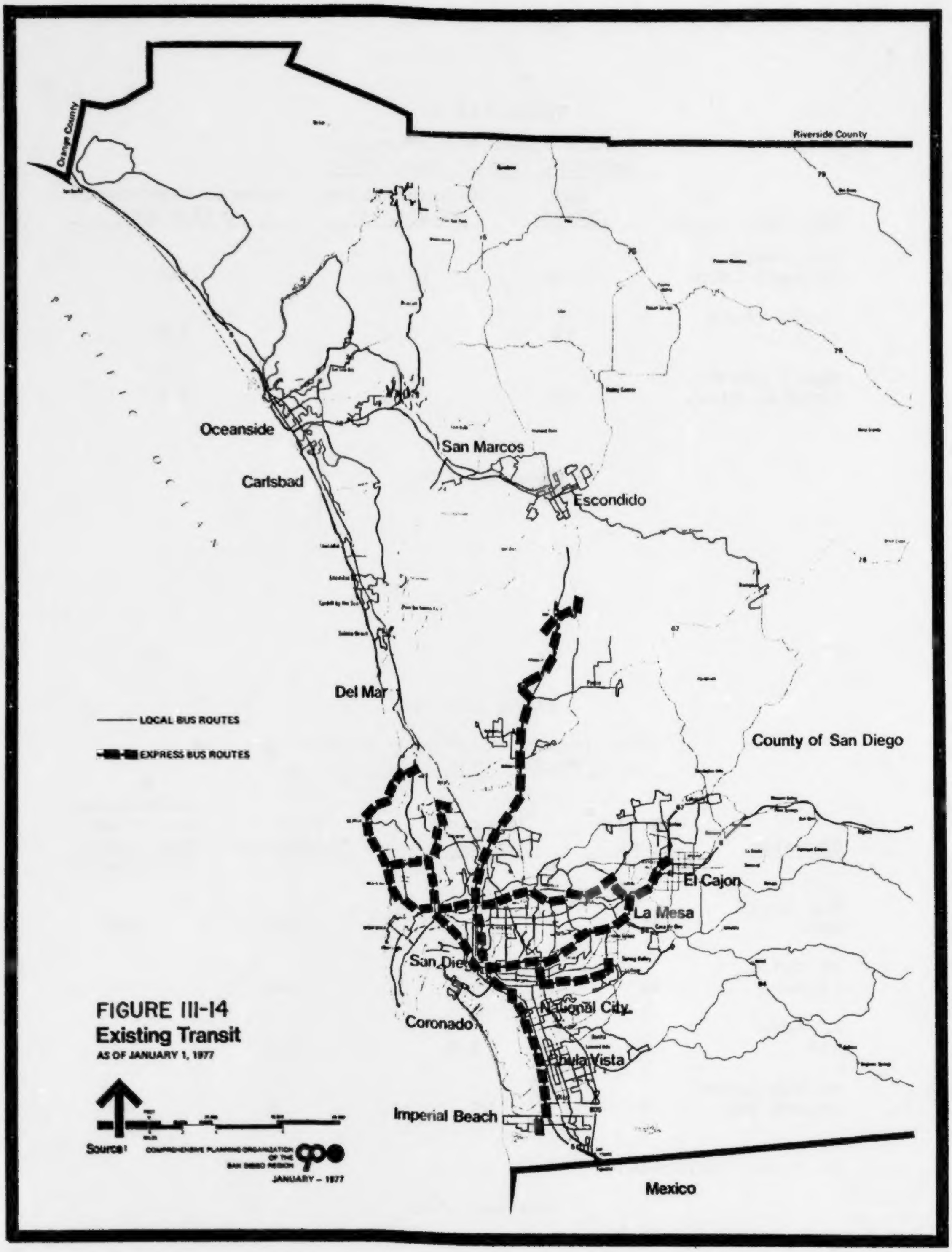

FIGURE III-14
Existing Transit
AS OF JANUARY 1, 1977

Source: COMPREHENSIVE PLANNING ORGANIZATION OF THE SAN DIEGO REGION
JANUARY – 1977

TABLE III-27

Public Fixed Route Transit Service, Fiscal Year 1977

Operator	Bus Fleet	Revenue Miles (millions)	Revenue Passengers (millions)
San Diego Transit Corp.	350	13.6	29.9
Chula Vista Transit	10	0.4	1.0
North County Transit Dist.	85	4.5	3.6

Source: CPO

TABLE III-28

Public Demand-Responsive Service Fiscal Year 1977

Operator	Vehicle Fleet	Average Trip Length	Total Passengers	Handicapped and Elderly Passengers (thousands)
San Diego DAR	21	5	138	138
El Cajon Express	18	3.4	188	94
La Mesa DAR	6	3.6	110	55
SE San Diego County DAR	2	50	6	NA

NA = not available.

Source: CPO

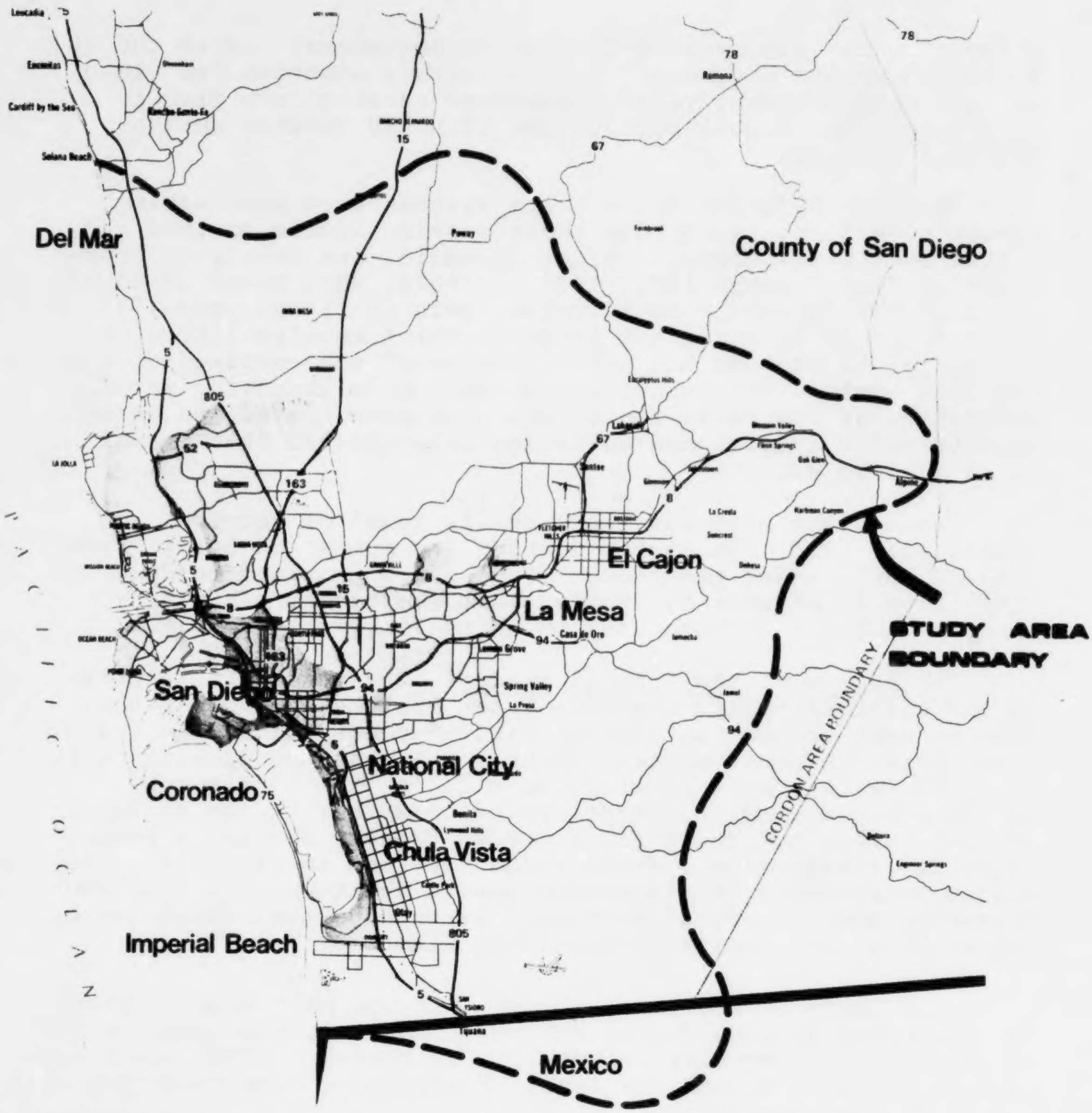

FIGURE III-15

Transit Travel Time Contours From Centre City San Diego – 1975

○ 60 MINUTE TRAVEL TIME CONTOUR

● 30 MINUTE TRAVEL TIME CONTOUR

Note: Express Bus Routes Excluded.

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between buses) and many SDTC buses on peripheral routes run at 30- to 45-minute headways. Routes serving downtown San Diego operate more frequently, with headways ranging from five to 15 minutes during peak periods and 15 to 30 minutes during off-peak periods.

Both the SDTC and Chula Vista systems have been making concerted efforts to improve their service levels so that they better meet rider demand. After expanding its levels of operation in fiscal years 1974, 1975 and 1976, SDTC found it could not financially afford to increase again in fiscal year 1977. Instead, it is carrying out projects which require little or no capital investment but will "fine tune" the workings of the existing system. For example, the system is improving service on peripheral routes to facilitate crosstown travel and doing time-transfer studies and adjusting schedules so that travel times will be cut.

Chula Vista also has improved its level of service. In fiscal year 1976, the system doubled its number of buses (from five to ten), added two routes, and reduced maximum headway times from 90 minutes to 60 minutes. The system has also recently added a CBD (central business district) shuttle.

Problems with the Transit System. The main deficiencies in the existing public transit system are the infrequent service on many routes and slow operating speeds which make travel times high. Express routes, which supplement the local arterial lines, have made some progress in reducing travel times by taking advantage of the higher speeds possible on the freeway system. Trips not bound for downtown usually involve a long delay in transferring. While route coverage is extensive, the system is predominantly oriented toward downtown with limited crosstown and peripheral service. As noted above, these latter two problems are currently receiving attention from SDTC.

The improved service provided over the past several years has generated so much demand for public transit that peak period overloading is a regular feature of the system. SDTC is not financially able to expand its level of service enough to accommodate that increased demand.

The operating costs incurred by the public operators require continued reliance on public subsidies to continue operation and expand service. In fiscal year 1976, San Diego Transit operated at a net cost of $ .61 per passenger.

CPO Regional Transportation Plan

A Regional Transportation Plan (RTP) has been adopted by the Comprehensive Planning Organization (CPO). The RTP is a set of adopted policies, plans and programs to guide effective coordination and orderly programming of transportation improvements among local, regional, state and federal participants in the San Diego region. It was developed through a continuing, comprehensive and cooperative planning process, is an integral element of the Regional Comprehensive Plan, and was adopted by the policy makers of the Regional Transportation Planning Agency (CPO). The plan was submitted to the State of California to become an element of a statewide master plan for transportation.

. The plan emphasizes the improvement of transportation within the existing urbanized region. The service, design and performance characteristics of the plan are summarized below:

1. New construction and reconstruction of regional and local transportation facilities should give priority to:

   - The multimodal requirements of transportation corridors;
   - The complementary relationship between transportation access and land development, and the multi-use potential of transportation corridors created by the regional and local transit and highway system. Joint development and/or multi-use of transit and highway rights-of-way should be pursued to the fullest extent possible.

2. The regional transit system should be designed and operated to maximize pedestrian, bicycle, automobile (park and ride) and local transit access to transit terminals and stations. The need to change travel modes or transfer in route should be minimized.

3. Where cost-effective, regional and local transit systems should take maximum advantage of proven technology.

4. The design and operation of local transportation systems should be consistent with the character of the area to be served. Implementing agencies and local jurisdictions should have the primary responsibility for determining the type and level of service of these local networks.

5. The design and operations of the regional transportation system should be consistent with the character of the area to be served. The regional transportation planning agency should have primary responsibility for determining the type and level of service of the regional system. Local jurisdictions and the implemen-

ting agencies should have primary responsibility for determining the precise location of the routes and access points consistent with adopted corridor and basic performance characteristics of the regional system.

6. Centre city San Diego and other important regional activity centers should be served by appropriate circulation and distribution systems which are compatible with the regional system.

7. The Regional Transit System's major attributes should be:

- An intermediate capacity, fixed guideway transit network in high volume corridors.
- An express bus network providing high levels of transit service in those crosstown and radial transportation corridors having only moderate travel demands.
- Local community-scaled transit service may be locally operated but should function as an integral part of the total regional system. As determined by the local community served, this local service could be provided by a demand responsive or fixed route system.

The CPO Board of Directors on March 17, 1975, adopted the following financial and institutional policies to implement the RTP:

1. The Board of Directors recommends to the Legislature of the State of California that the state gas tax be increased at a rate sufficient to keep up with highway cost increases and that this increase be of sufficient magnitude to permit the diversion of 25% of the state gas tax receipt to transit construction.

2. The Board of Directors endorses, as sources of local funding, and as demonstration of local commitment to achieving long-term transit goals, the proposal to place before the electorate at the earliest appropriate date the proposition that the regional transit entity (or entities) be empowered to assess within its jurisdiction up to a one-half cent sales tax (or a combination of sales and other tax sources sufficient to provide the equivalent funds).

3. Prior to construction of any fixed guideway, the area within approximately 1/2 mile of the guideway should be placed within an area of benefit. An incremental tax program should be created to turn a portion of the increased revenues developed over to the transit constructor/operator to defray costs of the guideway. The Board of Directors should seek necessary legislation in order to achieve tax increment authorization.

4. In order to assure coordination with regional and local land use policies, transportation system planning shall be the responsibility of the regional transportation planning agency composed of locally elected officials representing all units of general purpose governments of the region and carried out in the context of

regional comprehensive planning. System planning shall include technology selection and the determination of the performance characteristics of the transportation systems including the general location of routes and access points, the capacity of the systems, and the overall staging of such systems.

5. The allocation of monies from state and federal sources to the various modes of transportation is a regionwide policy issue and is best accomplished by a multi-modal, areawide transportation planning agency under the control of locally elected officials representing all units of general purpose governments within the region.

6. Precise project planning, in conformance with the adopted regional transportation plan, shall be the responsibility of the implementing agencies.

7. The regional transportation plan proposes that a regional transit entity (or subregional entities) be formed at the earliest possible date.

8. Legislation-created transit implementation entity (or entities) should address all aspects of public transit operations, including the relationship of the new entity (or entities) to existing transit operators.

Of the various elements included in the plan, transit has received the most attention. That element calls for a 60-mile fixed guideway transit system to be constructed in the cities of Chula Vista, El Cajon, La Mesa, National City and San Diego, with access to the system and feeder bus systems. Current studies are directed at determining the feasibility of that system as well as more precise cost estimates and alignment possibilities. Other elements of the RTP include the highway element, a non-motorized element, aviation element and the air quality element.

Noise and Visual Quality

Existing background noise levels vary throughout the region depending on distance to major arterials, airports and industry. Typical average sound levels for residential and agriculture areas range from 30 to 50 decibels. Denser urban area noise levels range from 48 to 65 decibels. Higher noise levels are generally related to air and freeway traffic.

City and county governments in the study area have noise ordinances which attempt to restrict noise sources in location, intensity and duration. Basic information on noise health effects, levels of jurisdictional responsibility for noise control, and local noise control ordinances can be found in Comprehensive Planning Organization of the San Diego Region publications (1974).

The San Diego area is one of diverse visual character. It is regionally subdivided into distinct northwest trending geomorphic units -- coastal plains and interior uplands and mountains. The region is relatively arid; several man-made reservoirs are the only free water west of the ocean bays and lagoons of the coast. Major vegetation is concentrated along the intermittent streams draining to the reservoirs and the floodplains cutting through the coastal plain to the ocean.

The existing freeways afford the user a wide variety of vistas and images. State Route 163 through Balboa Park must be ranked as one of the most scenic urban freeways in the United States. Much of I-5 North and I-8 have attractive vistas. Many of these are identified on the vista maps of the Initial Coastline Plan for the region. I-8 and I-15 have basically rural vistas soon after leaving the immediate metropolitan area. State Route 94 through southeast San Diego and Lemon Grove has many exposed cuts and spotty mixtures of urbanization -- commercial, residential and industrial -- which comprises the motorists view. I-5 from I-8 south to the Mexican Border is in older built-up urban areas, frequently near the railroad tracks with their long established unrestrictive industrial zoning. The result is a panorama of factory roofs, billboards, electrical transmission towers and auto wrecking yards.

IV. INSTITUTIONAL AND REGULATORY FRAMEWORK

The following is a checklist of governmental agencies and departments that have either regulatory authority or planning responsibility that may affect the planning and implementation of a wastewater treatment and disposal plan in San Diego County. Only those permit requirements, regulatory policies and legal responsibilities that may influence a project in the area are mentioned. Figure IV-1 indicates a number of agencies whose activities may affect the implementation of the Facilities Plan.

Major Implementing and Regulatory Agencies

U. S. Environmental Protection Agency

The Environmental Protection Agency (EPA) is charged with administering the Federal Water Pollution Control Act (PL 92-500), the Federal Clean Air Act and the Federal Safe Drinking Water Act (PL 93-523). Under terms of the Federal Water Pollution Control Act, EPA is required to prepare and enforce minimum water quality standards for the nation. The 1972 amendments to this act established the National Pollution Discharge Elimination System (NPDES), which allows EPA to require a permit for any discharge of waste materials to a waterway. Because California has a near equivalent to the Federal Water Pollution Control Act, the Porter-Cologne Act, the federal government has delegated major authority to the California State Water Resources Control Board (SWRCB) for establishing and enforcing water quality standards. The Regional Water Quality Control Boards (RWQCB) are performing the majority of the regulatory functions at the local level. In order to comply with the Federal Water Pollution Control Act timetable, all treatment plants discharging to surface waters must meet the *federal secondary treatment effluent requirements* by July 1, 1977 (Federal Register, Vol. 40, No. 159, August 15, 1975). By July 1, 1983, all municipal treatment facilities must have instituted "Best Practicable Waste Treatment Technology". By July 1, 1985, municipal treatment facilities must have reached a condition of "no discharge" of pollutants. In the definition of "no discharge", complete elimination of discharge is not implied; only elimination of discharge of pollutants, where a pollutant is defined as anything that adversely affects the quality of water necessary to support a beneficial use.

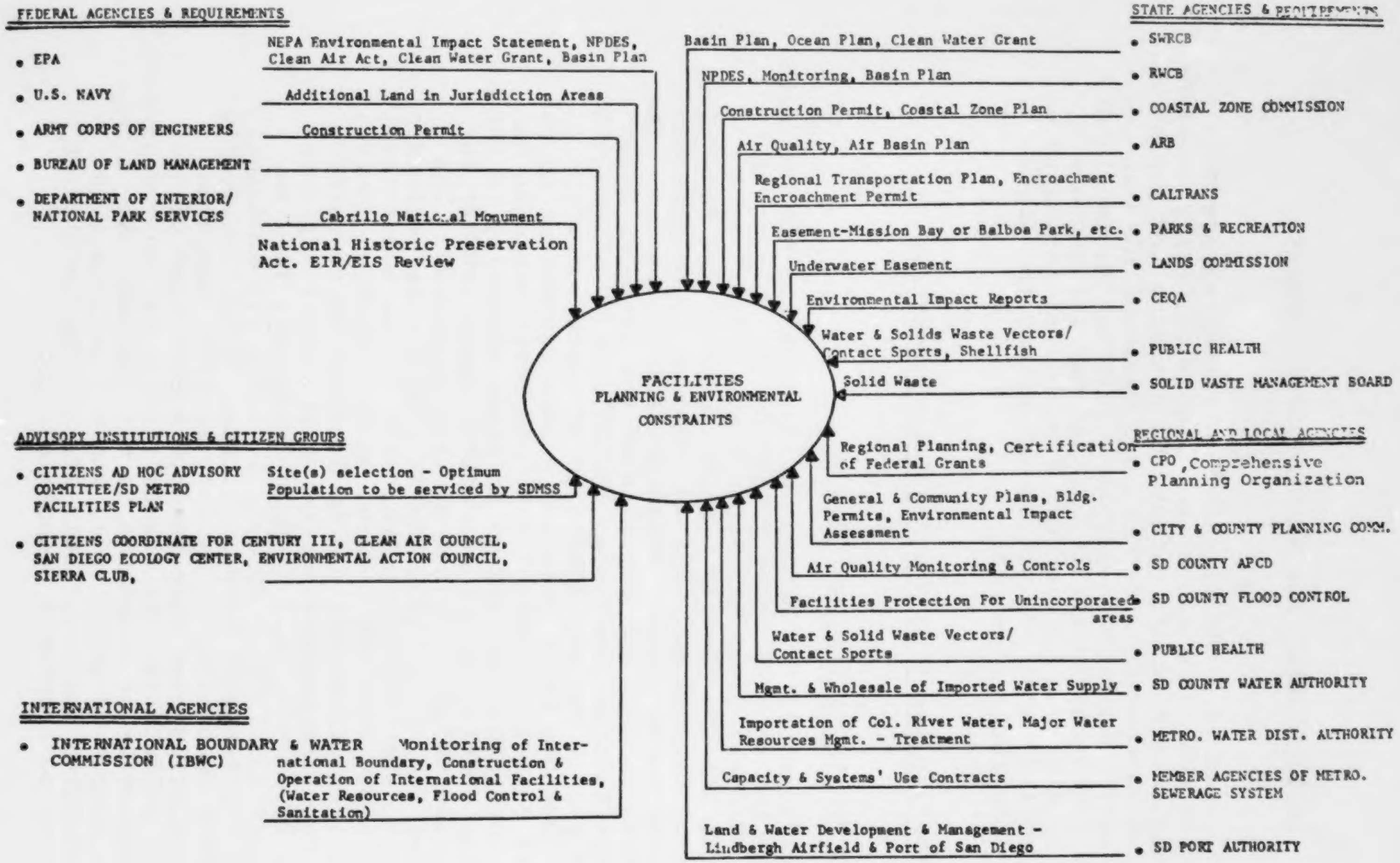

FEDERAL AGENCIES & REQUIREMENTS
EPA
U.S. NAVY
ARMY CORPS OF ENGINEERS
BUREAU OF LAND MANAGEMENT
DEPARTMENT OF INTERIOR/ NATIONAL PARK SERVICES
NEPA Environmental Impact Statement, NPDES, Clean Air Act, Clean Water Grant, Basin Plan
Additional Land in Jurisdiction Areas
Construction Permit
Cabrillo National Monument
National Historic Preservation Act. EIR/EIS Review
ADVISORY INSTITUTIONS & CITIZEN GROUPS
CITIZENS AD HOC ADVISORY COMMITTEE/SD METRO FACILITIES PLAN
Site(s) selection - Optimum Population to be serviced by SDMSS
CITIZENS COORDINATE FOR CENTURY III, CLEAN AIR COUNCIL, SAN DIEGO ECOLOGY CENTER, ENVIRONMENTAL ACTION COUNCIL, SIERRA CLUB,
INTERNATIONAL AGENCIES
INTERNATIONAL BOUNDARY & WATER COMMISSION (IBWC)
Monitoring of International Boundary, Construction & Operation of International Facilities, (Water Resources, Flood Control & Sanitation)
FACILITIES PLANNING & ENVIRONMENTAL CONSTRAINTS
STATE AGENCIES & REQUIREMENTS
Basin Plan, Ocean Plan, Clean Water Grant
SWRCB
NPDES, Monitoring, Basin Plan
RWCB
Construction Permit, Coastal Zone Plan
COASTAL ZONE COMMISSION
Air Quality, Air Basin Plan
ARB
Regional Transportation Plan, Encroachment Encroachment Permit
CALTRANS
Easement-Mission Bay or Balboa Park, etc.
PARKS & RECREATION
Underwater Easement
LANDS COMMISSION
Environmental Impact Reports
CEQA
Water & Solids Waste Vectors/ Contact Sports, Shellfish
PUBLIC HEALTH
Solid Waste
SOLID WASTE MANAGEMENT BOARD
REGIONAL AND LOCAL AGENCIES
Regional Planning, Certification of Federal Grants
CPO, Comprehensive Planning Organization
General & Community Plans, Bldg. Permits, Environmental Impact Assessment
CITY & COUNTY PLANNING COMM.
Air Quality Monitoring & Controls
SD COUNTY APCD
Facilities Protection For Unincorporated areas
SD COUNTY FLOOD CONTROL
Water & Solid Waste Vectors/ Contact Sports
PUBLIC HEALTH
Mgmt. & Wholesale of Imported Water Supply
SD COUNTY WATER AUTHORITY
Importation of Col. River Water, Major Water Resources Mgmt. - Treatment
METRO. WATER DIST. AUTHORITY
Capacity & Systems' Use Contracts
MEMBER AGENCIES OF METRO. SEWERAGE SYSTEM
Land & Water Development & Management - Lindbergh Airfield & Port of San Diego
SD PORT AUTHORITY

FIGURE IV-1
INSTITUTION AND REGULATORY FRAMEWORK

Source: El Wardani, 1977.

Under Section 208 of the Federal Water Pollution Control Act, EPA is also responsible for approving plans and programs of areawide water quality planning. The state must identify regions with "substantial water quality control problems" and authorize a single organization to operate "a continuing areawide waste treatment management planning process". The Comprehensive Planning Organization of San Diego is performing 208 planning.

EPA, under Section 201 of the Federal Water Pollution Control Act, also participates in the Clean Water Grant program which funds wastewater system improvement projects. This funding system is also operated jointly with the state; the SWRCB has been given primary responsibility in administration of the program. This EIS is a required element of the application for Clean Water Grant funds and was mandated by the National Environmental Policy Act of 1969, and has been prepared by EPA to comply with the NEPA Regulations (Appendix J).

In administering the Federal Clean Air Act, EPA has established National Ambient Air Quality Standards (NAAQS). These standards are designed to protect human health from the effects of chronic air pollution. Any project that creates local air pollution conditions in excess of NAAQS may have federal funding withheld. A further explanation of EPA's role in maintenance of air quality is presented in the Air Quality section of this report.

The Federal Safe Drinking Water Act of 1974 required EPA to set standards for drinking water quality and to establish guidelines for state regulation and enforcement of these standards. It also gave EPA the responsibility of protecting underground sources of drinking water. Protection will probably be implemented by requiring permits for injection of wastes into usable aquifers and by prohibiting waste disposal operations that will endanger the quality of drinking water sources. National interim primary drinking water regulations were released by EPA (Federal Register, Vol. 40, No. 248, December 24, 1975).

EPA, under Executive Order 11990 (Federal Register, Vol. 42, No. 101, Wednesday, May 25, 1977), is required to stop supporting construction in wetlands where there is a practicable alternative. The agency is required to take action "... to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands...".

California State Water Resources Control Board

The California State Water Resources Control Board (SWRCB) is responsible for administering portions of the Federal Water Pollution Control Act and California's Porter-Cologne Act. Under conditions of these acts, the SWRCB has required the San Diego Regional Water Quality Control Board (RWQCB) to prepare a basin plan for maintenance of water quality in the San Diego basin. The basin plan and its water quality objectives have been approved by the SWRCB. The State Board must also review all RWQCB discharge requirements placed on treatment plants in the project area. The SWRCB is the administrator of California's Clean Water Grant funds and the principal reviewer of this plan's application for state and federal funding. An environmental impact report is required (California Environmental Quality Act of 1970) for state funding if the project will have a significant effect on the environment.

The basin plan -- Comprehensive Water Quality Control Plan Report - San Diego Basin -- was adopted in 1975. The purpose of this plan was: 1) the establishment of beneficial uses for water bodies within the San Diego basin; 2) development of water quality standards compatible with such beneficial uses; 3) definition of the level of treatment necessary to attain or maintain these standards and ensure continuance of the beneficial uses; and 4) description and evaluation of alternative water quality management plans. In the determination of objectives and standards in the basin plan, numerous other SWRCB plans and policies were adhered to.

In addition, the SWRCB requires that all projects funded under the Clean Water Grant Program give consideration to conjunctive management of surface/groundwater resources with wastewater resources. Recent changes in the Clean Water Grant Program regulations (Title 23, California Administrative Code, Chapter 3, Subchapter 7) make the development of wastewater reclamation facilities a secondary objective of the Clean Water Bond Law and the State Clean Water Fund.

The SWRCB has also prepared the Water Quality Control Plan - Ocean Waters of California which includes water quality objectives, effluent quality requirements and management principles for waste discharge to the ocean. The policies and objectives of this document must be considered if a second ocean outfall is constructed as part of the regional treatment facility and for the continued operation of Point Loma.

Regional Water Quality Control Board - San Diego Region

California Regional Water Quality Control Boards have the principal responsibility for enforcing the Federal Water Pollution Control Act and the state's Porter-Cologne Act. The SWRCB establishes water quality policy and the RWQCB implement or enforce that policy by issuing waste discharge permits and National Pollution Discharge Elimination System permits, establishing waste discharge requirements for individual dischargers and monitoring the quality of wastewater discharges. All alternatives developed for this project must satisfy waste discharge requirements that have been established by the San Diego RWQCB.

California Department of Health

The California Department of Health has established water quality standards for use of reclaimed wastewater in crop irrigation. These standards are described in the California Administrative Code (Title 22, Sections 60301-60357). The quality of discharge waters reaching domestic water supplies is also a Department of Health concern. Wastewater must not lower domestic water supply quality below the California Domestic Water Supplies Quality Standards. The irrigation disposal and impoundment of effluent considered in several of the conceptual alternatives in the Facilities Plan is subject to Department of Health regulation and monitoring. The majority of the regulation and monitoring is actually accomplished by the RWQCBs which follow the Department of Health Standards in setting waste discharge requirements for individual dischargers. The Department of Health can also act unilaterally in ensuring compliance with the standards.

U. S. National Park Service

The National Park Service and the Advisory Council on Historic Preservation, under the Historic Preservation Act of 1966 (PL 89-665), administers and maintains the National Register of Historic Places. The intent of the Act is to preserve those places of significance in American history, architecture, archeology, and culture. Previously the National Register included only nationally significant places but with the Historic Preservation Act of 1966, responsibility has been delegated to the states to develop and implement a comprehensive State Historic Preservation Plan.

San Diego County Department of Public Health

The Department of Public Health has the authority to halt any violation of the California Health and Safety Code. This includes contamination of domestic, agricultural or recreational waters, creation of hazardous vector populations, or creation of hazardous working conditions on the agricultural lands of the county. Health departments periodically monitor local water quality in order to detect unsafe conditions. The waste disposal or reclamation and reuse options considered in the Facilities Plan would be monitored by the Health Department for compliance with state Health and Safety Code legal requirements and State Health Department regulations, policies and guidelines.

San Diego Local Agency Formation Commission

The Local Agency Formation Commission is a regulatory body responsible for the discouragement of urban sprawl and the encouragement of the orderly formation and development of local governmental agencies based upon local conditions. The two acts empowering LAFCO are the Knox-Nisbet Act and the District Reorganization Act of 1965. In meeting its responsibility, LAFCO is required to review and approve or disapprove proposals for incorporation of cities, exclusion of territory from a city, the consolidation of two or more cities, the formation and reorganization of special districts and the annexation of territory to local agencies.

A primary function of LAFCO is to determine the spheres of influence for the probable ultimate physical boundaries and service areas of governmental agencies. The wastewater treatment facilities plan will play an important role in influencing these decisions since LAFCO must consider present and probable future wastewater treatment needs of an area and the adequacy of existing treatment service.

California Air Resources Board

The role of the California Air Resources Board is discussed in the Air Quality section of this report.

Other Permit/Regulatory Agencies

U. S. Coast Guard would regulate pipeline construction in ocean waters to ensure boat safety.

U. S. Department of the Army, Corps of Engineers would require a Section 404 (Federal Water Pollution Control Act) permit for any dredging or placement of spoil that might accompany construction of an ocean outfall.

California Department of Fish and Game would require a Section 1602 (California Fish and Game Code) permit for any modifications of stream flow, banks or channels resulting from implementation of the conceptual alternative proposed in the Facilities Plan. This includes pipeline construction across a river.

California Department of Parks and Recreation helps to administer the National Historic Preservation Act in California; ensures protection of National Register of Historic Places sites and California Historical Landmarks from state and federally-funded projects.

California State Lands Commission would require a lease of state property for construction of an outfall.

San Diego Air Pollution Control District would require a permit for flaring of digester gas or incineration of sludge if these operations were used.

County of San Diego and Cities within the Study Area would require permits for changes in land use, pipeline construction along roads and construction of structures on the treatment plant site.

California State Solid Waste Management Board. Comprehensive plans for solid waste management are required in the Nejedly-Z'berg Solid Waste Management and Resource Recovery Act of 1972. The State Solid Waste Management Board created by the act reviews plans submitted by local governments. In addition to health and sanitation regulations, the board must recognize state water quality and national air quality control plans. Guidelines for solid waste plan development require permit systems for waste handlers and disposal site operators.

General Planning Agencies

California Coastal Commission

The California Coastal Commission (CCC) was established: "1) to prepare a comprehensive, coordinated, enforceable plan for the orderly, long-range conservation and management of the natural resources of the coastal zone, and 2) during the planning period, to regulate development in coastal waters and in a 1,000-yard shoreline permit area to ensure that improper development did not undercut the plan being prepared" (California Coastal Zone Conservation Commission, 1975).

The CCC planning area lies along the California coast, extending three miles seaward and five miles landward of the mean high tide line. Its permit zone encompasses all of the seaward portion of that area and the first 1000 yards inland from the tide line. The Commission has authority to grant or deny permits for the construction of specific facilities whose sites fall within its jurisdiction. Permits, when granted, may be granted outright or with conditions. The near-coastal portion of the project study area lies within the Commission's permit area and a large part of the remainder of the study area lies within its coastal resource management area.

In 1974, the Commission affirmed issuance of a permit to the City of San Diego for the construction of Sedimentation Basins Nos. 5 and 6 at the Point Loma metropolitan wastewater treatment facility. In granting the permit, though, the Commission added conditions requiring the city to (1) "use its best efforts" to obtain secondary treatment by 1977 and present CCC with a list of feasible secondary treatment sites within the coastal zone by February, 1975; (2) determine the ultimate growth to be served by the metropolitan sewage system and present that information to CCC by February, 1975; (3) develop and demonstrate an effective water conservation program prior to application for expansion of sewage treatment facilities; and (4) present plans for the reuse of sewage effluent and plans for alternative sludge-drying sites to CCC by January, 1976.

In March, 1977, the State Commission commented on the draft Environmental Impact Report for the San Diego Metropolitan Facilities Plan. Those comments expressed concerns regarding (1) the proposal to locate a treatment plant in the flood plain of the Tia Juana River; (2) the proposal to continue primary treatment; and (3) the indirect or growth-inducing impacts of the project on the coastal zone, particularly if a South Bay treatment site were chosen.

San Diego Comprehensive Planning Organization

The Comprehensive Planning Organization (CPO) is the San Diego County Council of Governments (COG) and the designated Areawide Water Quality Planning Agency. The agency has also been designated under the Federal Office of Management and Budget, Circular A-95, as the areawide agency to review applications for selected Federal grants. In its role of COG, it functions as a regional planning body whose actions are advisory to the city councils and Board of Supervisors of its members. Its Board of Directors makes policy decisions on such regional issues as transportation, housing, public facilities management, and capital investment. Its membership includes the County of San Diego and the cities of Carlsbad, Chula Vista, Del Mar, Coronado, El Cajon, Escondido, Imperial Beach, La Mesa, National City, Oceanside, San Diego, San Marcos and Vista. The California Department of Transportation (Caltrans) is an ex-officio member and Tijuana, Baja California is an honorary member.

In its role as the Areawide Water Quality Planning Agency, CPO directs the 208 planning effort. The 208 planning jurisdiction includes the western two-thirds of San Diego County (the portion of the County that drains into the Pacific Ocean) plus the portion of Riverside County that lies within the Santa Margarita Basin (generally the southwestern part of the county). As defined in section 208 of the 1972 Amendments to the Federal Water Pollution Control Act (PL 92-500), is intended to provide for (1) the elimination of pollutant discharge into navigable waters by 1985 and (2) wherever possible, water quality which provides for the "protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water" by July 1, 1983.

Specific elements of the water quality management plan will address: assessment of existing and potential problems; identification and projection of pollution sources; nonpoint source assessment; water quality standards; total allowable maximum daily loads; point source load allocations; municipal and industrial waste treatment systems needs; nonpoint source control needs; residual waste control and land disposal needs; and urban and industrial stormwater systems needs.

V. EXISTING AND PROPOSED
WASTEWATER TREATMENT FACILITIES

Description of Existing Treatment System

San Diego Metropolitan Sewer System

The San Diego Metropolitan Sewer System is composed of some 17 participating agencies which together generate a flow of 115 mgd average daily flow (January 1- March 31, 1977). The majority of this combined flow is conveyed to central treatment facilities located at Point Loma for primary treatment and subsequent ocean discharge. Table V-1 lists the participating agencies together with their flow. Two small treatment facilities are located within the area served by the San Diego Metropolitan system - Santee County and Brown Field.

Interceptors. Some 18 miles of interceptor sewers connect the various components of the San Diego system to the central facility. Table V-2 shows the size and flow capacities of these various components. Figure V-1 indicates participating agencies and the location of the various interceptors. Agencies served by the south branch of the system include: Tijuana, San Ysidro, Imperial Beach, Nestor, Palm City, Imperial Beach Naval Air Station, Montgomery Sanitation District, Chula Vista, Spring Valley Sanitation District, East San Diego, North Park, Naval Station, Coronado, North Island Naval Air Station, Naval Amphibious Base, La Mesa, Rolando Sanitation District and downtown San Diego. The total length of the South Branch Interceptor is roughly 15 miles, with its alignment roughly paralleling that of Interstate 5. The point of beginning is the intersection of 19th Street and Coronado Avenue in Nestor, with the northerly terminus at the Metro Pump Station No. 2 adjacent to Lindbergh Field. The majority of the interceptor is plastic-lined, reinforced concrete pipe.

The North Branch of the interceptor is only 2 miles in length and goes from the San Diego River to Pump Station No. 2, which is connected to the treatment facility at Pt. Loma via an 87-inch force main and a 108-inch tunnel.

Currently, the interceptor system is functioning well except for the approximately six and one-third miles of unlined concrete pipe. Because of the rather long residence time within the piping system, anaerobic decay of the sewage is taking place within the pipeline itself. As a result of this

Table V-1

METROPOLITAN SEWER SYSTEM FLOWS AND CAPACITIES
(January 1, 1977 – March 31, 1977)

Member Agencies	Capacity Rights in Metro System (MGD)	Flows as Reported for Billing Purposes by City of S.D. (MGD)	Flows generated within boundaries of each agency. Flow corrected for all Interagency transfers. (MGD)	Remaining Capacity (MGD)	Remaining Capacity Based on NPDES Permit of 120 MGD (Dry weather)
Chula Vista	22.10	4.76	6.93	15.17	
Coronado	3.00	1.84	1.84	1.16	
Del Mar	0.80	0.44	0.44	0.36	
El Cajon	10.00	7.41	7.90	2.10	
Imperial Beach	3.50	2.88	2.88	0.62	
La Mesa	6.00	4.27	4.24	1.76	
National City	8.10	3.58	3.51	4.59	
Lakeside-Alpine	2.16	1.72	1.72 (1.700)[5]	0.44 (0.46)[5]	
Lemon Grove	2.80	1.64	1.82 (1.899)[5]	0.98 (0.901)[5]	
Montgomery	4.00	2.58	1.28 (1.493)[5]	2.72 (2.507)[5]	
Rolando	0.30	0.23	0.23	0.07	
Spring Valley	6.00	5.89	4.46 (4.460)[5]	1.54	
Padre Dam[3]	3.30	2.96	2.96	0.34	
Pomerado	2.00	2.43	2.43	-0.43	
San Diego (inc Navy plus regional dev.)	45.94[4]	67.86	67.86	-26.37[4] (inc. Tijuana)	
Tijuana[2]	0	4.45	4.45		
Otay MWD[2]	0	0			
Total	120.0	114.9	114.9	5.1	7.34 MGD[6]

[1] Corrected for Interagency transfers between City of San Diego and member agencies.

[2] Nonmember flows – Otay 0.30 included in Spring Valley.

[3] Contractual rights changed during this quarter.

[4] Based on a NPDES Permit of 120 mgd. Based on an Ultimate Design capacity of 233.92 MGD, Column (2) figure for San Diego is 159.86 and figure in Column (5) is +87.55.

[5] Average daily flow for the previous 12 months (ending March 31, 1977) as reported by County for its four member agencies are shown in parentheses (reference: SFC4/2061)

[6] Based on an average dry weather flow of 112.66 mgd.

Source: Comprehensive Planning Organization of the San Diego Region, INFO 77, No. 3

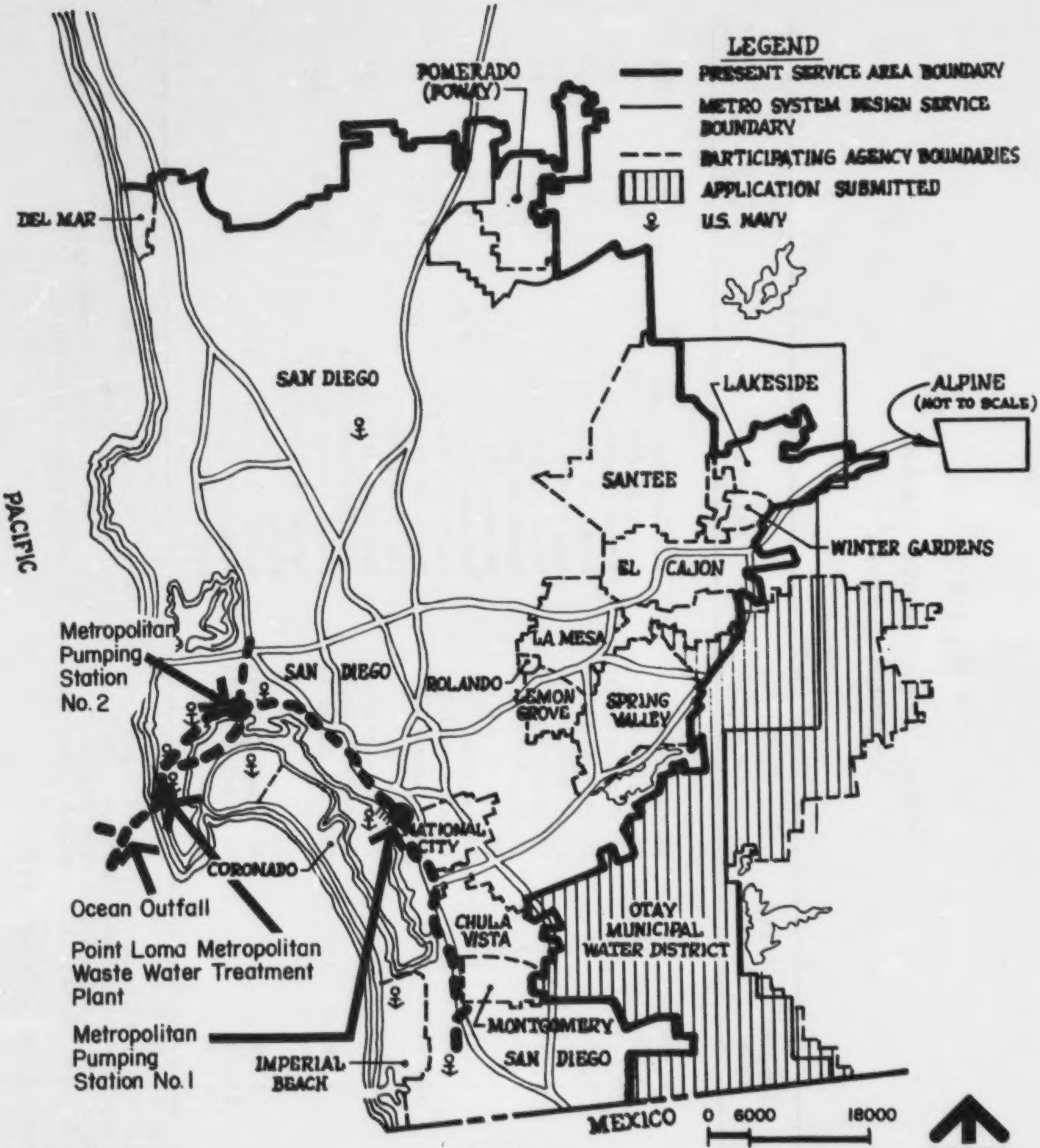
TABLE V-2

DESCRIPTION OF METRO SYSTEM INTERCEPTOR SEWER[a]

Sewer Designation[a,b]	Length, feet	Size, inches	Material[c]	Location[d]	Capacity Design MGD	Flow[g] Ultimate MGD
I-1	2,904	42	PL Granitic RCP	Southernmost end	27.6	24
I-2	3,916	54	PL Granitic RCP	South of Sta. No. 1	27.7	28
I-3	10,197	72	PL Granitic RCP	South of Sta. NO. 1	55.4	41
I-4	9,454	78	PL Granitic RCP	South of Sta. NO. 1	69.7	59
I-5	5,874	90	PL Granitic RCP	South of Sta. No. 1	105.5	89
I-6	7,549	96	PL Granitic RCP	South of Sta. No. 1	118.3	99
I-7	5,500	78	PL Granitic RCP	North of Force Main 1	169.3	150
I-8	11,088	84	PL Tunnel RC	Between Sta. No. 1 & 2	169.3	157
I-9	1,595	102	. Calcareous RCP	Between Sta. No. 1 & 2	179.1	157
I-10	11,166	108	. Calcareous RCP	South of Sta. No. 2	190.8	168
I-11	12,631	96	. Calcareous RCP	North of Sta. No. 2 to San Diego River	186.4	164
I-12	3,928	108	Plastic lined Concrete Tunnel	Between Force Main 2 and Treatment Plant	337.8	332
I-13	7,883	114	. Unlined Granitic	Between West Portal Tunnel & Treatment Plant	360.3	332
FM-1	8,382	72	RC Steel Cylinder	North of Sta. No. 1		
FM-2A	15,104	87	RC Steel Cylinder	Between Sta. No. 2 and Tunnel Sewer		
FM-2B	14,741	87	Special RCP			

[a] Source: City of San Diego, Water Utilities Department; Ref. Brown & Caldwell [b] Sewer coded I are gravity sewers, coded FM are forcemains [c] PL - Plastic lined, RCP - Reinforced Concrete Pipe, RC - Reinforced Concrete [d] Refer to Plate 4.2 for location [e] Based on report by J.M. Montgomery, Consulting Engineers, Inc. 1971 [f] No computation available [g] Includes 13 MGD for- Tijuana, B.C., based upon maximum capacity of emergency connection.

Source: Lowry & Associates, 1976.



SAN DIEGO

METROPOLITAN SEWERAGE SYSTEM

PARTICIPATING AGENCIES

FIGURE V-1

Source: Lowry & Associates, 1976

decay process, hydrogen sulfide gas is generated, which dissolved in water under aerobic conditions, forms sulfuric acid which causes corrosion of the concrete pipe at the crown of the pipe. Several schemes to reduce this corrosion have been tried. The most current approach is the utilization of a vent system for the pipes in order to dilute the concentrations of hydrogen sulfide gas, thereby reducing the quantity of sulfuric acid formed. Additional odor control for this vent system was found to be necessary and is currently practiced via a trickling filter which functions as a wet scrubber and digests the offensive odors. A minor break occurred in the line during the weekend of July 4, 1977 and raw sewage entered the bay. The break occurred during contracted maintenance operations.

Corrosion will continue to be a problem which must be mitigated should a large-scale expansion of the San Diego system be undertaken. Alternative methods of corrosion control which might be utilized are: chemical additions to the sewage flow to inhibit the formation of hydrogen sulfide or oxidize it if formed; lining of the pipe; further increases in the venting system; and, decreasing the sewage residence time within the pipe. Should the sections of pipe where corrosion is taking place be converted to the flow of secondary treated sewage, then no additional corrosion would take place.

The San Diego system is also served by an extensive network of community and agency interceptors and trunk sewers. These sewers are listed in Table V-3 and their locations illustrated on Figure V-2.

Pump Stations No. 1 and No. 2 (Table V-4) are an important feature of the San Diego system. Pump Station No. 1 is located on South Harbor Drive opposite the Naval Station. It contains a mechanically cleaned screen for protection of the three pumps which have a total capacity of 132 mgd. Additional space is available for three more pumps, for an expanded capacity of 264 mgd. Estimated energy costs for pumping are $180,000, though these costs can be expected to increase with the increasing cost of energy.

Pump Station No. 2 is located adjacent to Lindbergh Field. The capacity of this station is 180 mgd with three pumps and expansion room to house a total of seven pumps. The energy costs for this station are $750,000/year.

Table V-3

DESCRIPTION OF COMMUNITY INTERCEPTOR AND TRUNK SYSTEM

Sewer No.[a]	Name[b]	Pipe sizes, in inches[c]	Design Capacity MGD[f]	Flow Measurements[d] Maximum Observed Flow, MGD	% of Design Capacity	Date[g] Measured	Condition[e]
2	Rose Canyon Interceptor	30-27-24-21-18-15	3.8	2.35	62	2/72	SC
4	E. Mission Bay Interceptor	60-42-14-12 F.M.-10	41	18	44	4/72	SC
5	N. Mission Valley Interceptor	66-54	47.5	13.8	32.5	4/70	NC
6	S. Mission Valley Trunk	66-30-27-21-18	7.0	7.2	103.0	4/71	C
7	Alvarado Interceptor	33-30-27-24-21-18-15	16.5	10.2	62	5/70	NC
8	Tecolote Canyon Trunk	24-21-18-15	8.6	6.5	76	12/72	SC
11	Morena Blvd. Trunk	33-30	10.5	12.1	115	8/70	C
13	Harbor Drive Trunk	60	49.0	20.0	41	7/72	NC
14	Ocean Beach Trunk	27-24	5.7	4.8	84	3/72	SC
17	Kearny Mesa Trunk	18-15-12	4.7	3.4	72	7/71	C
19	Wabash Interceptor	18-15	7.6	7.2	95	2/71	C
20	Chollas Valley Interceptor	48-36-30-27-24-18-15	6.4	6.0	94	7/70	C
22	Encanto Interceptor	48-36-27-24-21-18-15	10.2	6.5	64	6/72	SC
26	San Ysidro Interceptor	42-36-30	10.0	10.4	104	12/70	C
30	Fairmount Trunk	27-24-15-12	4.9	2.8	57	4/71	NC
33	Mission Gorge Interceptor	42-36	29.5	[i]	[i]	[i]	NC-SC
34	Murphy Canyon Trunk	36-33-30-15	18.7	[i]	[i]	[i]	NC-SC
42	Mira Mesa Trunk	30-24-21-15-12	8.6	[i]	[i]	[i]	NC-SC
44	Del Mar Interceptor	18-10	1	[i]	[i]	[i]	NC-SC
47	Carmel Valley Trunk	33-21-18-15	12.7	[i]	[i]	[i]	NC-SC
48	Penasquitos Interceptor	42-27-24-15-12-10	24.5	[i]	[i]	[i]	NC-SC
49	Carroll Canyon Trunk	33-27-24-18	25.0	[i]	[i]	[i]	NC-SC
50	Rose Canyon Parallel Interceptor	48-45-42-39-36-30-18 FM	37.0	[i]	[i]	[i]	NC-SC
61	2nd La Jolla-Pacific Trunk	48-42-30-21-15-12 F.M.	27.5	[i]	[i]	[i]	NC-SC
71	Pacific Highway Trunk	51-45-36-16 F.M.	29.0	[i]	[i]	[i]	NC-SC
80	Kettner Blvd. Interceptor	54-51-24	26.5	[i]	[i]	[i]	NC-SC
81	Trans-Bay Interceptor	24	6	[i]	[i]	[i]	
200	Montgomery Interceptor	36-27-15	16.0	[i]	[i]	[i]	
201	Coronado-Orange Ave. Trunk	21	2.5	[i]	[i]	[i]	
202	Imperial Beach Interceptor	18-15	2.0	[i]	[i]	[i]	
203	Chula Vista G Interceptor	18-12	4.3	4.9	100+	74	C
204	Chula Vista J Interceptor	24-18	7	5.0	71	74	SC
205	Spring Valley Interceptor	54-30	33	9.5	12	72	
206	National City Interceptor	36-27-18	11	4.5	31	74	
207	Spring Valley Trunk	24-18-15-12-10	0.7	0.5	66	74	
211	La Mesa Alvarado Interceptor	15	4	4.4	[i]	[i]	
212	Alpine Interceptor	15	1	[i]	[i]	[i]	
213	Los Coches Interceptor	15-10	1.8	[i]	[i]	[i]	
214	Lakeside Interceptor	18-15	3.5	[i]	[i]	[i]	
215	El Cajon Interceptor	42-33-21	13.5	[i]	[i]	[i]	
216	Poway Interceptor	27-24	8	3	[i]	[i]	
217	Tijuana Connection	30	13	13	100	74	
FM-4	Sorrento Interceptor Force Main	24	[i]	[i]	[i]	[i]	
FM-3	Penasquitos Interceptor Force Main	36	[i]	[i]	[i]	[i]	

[a] Source: City and County of San Diego, other participating agencies.

[b] Refer to Plate 4.2 for location.

[c] Underlined sizes refer to sections where flow measurements were observed. Pipe sizes are gravity sewers unless noted with F.M. referring to force mains.

[d] Flow measurements applicable to underlined pipe sections only-do not represent the entire length.

[e] Refers to the general condition of the sewers' capacity, C-critical condition, SC - semi-critical condition, NC - non-critical condition.

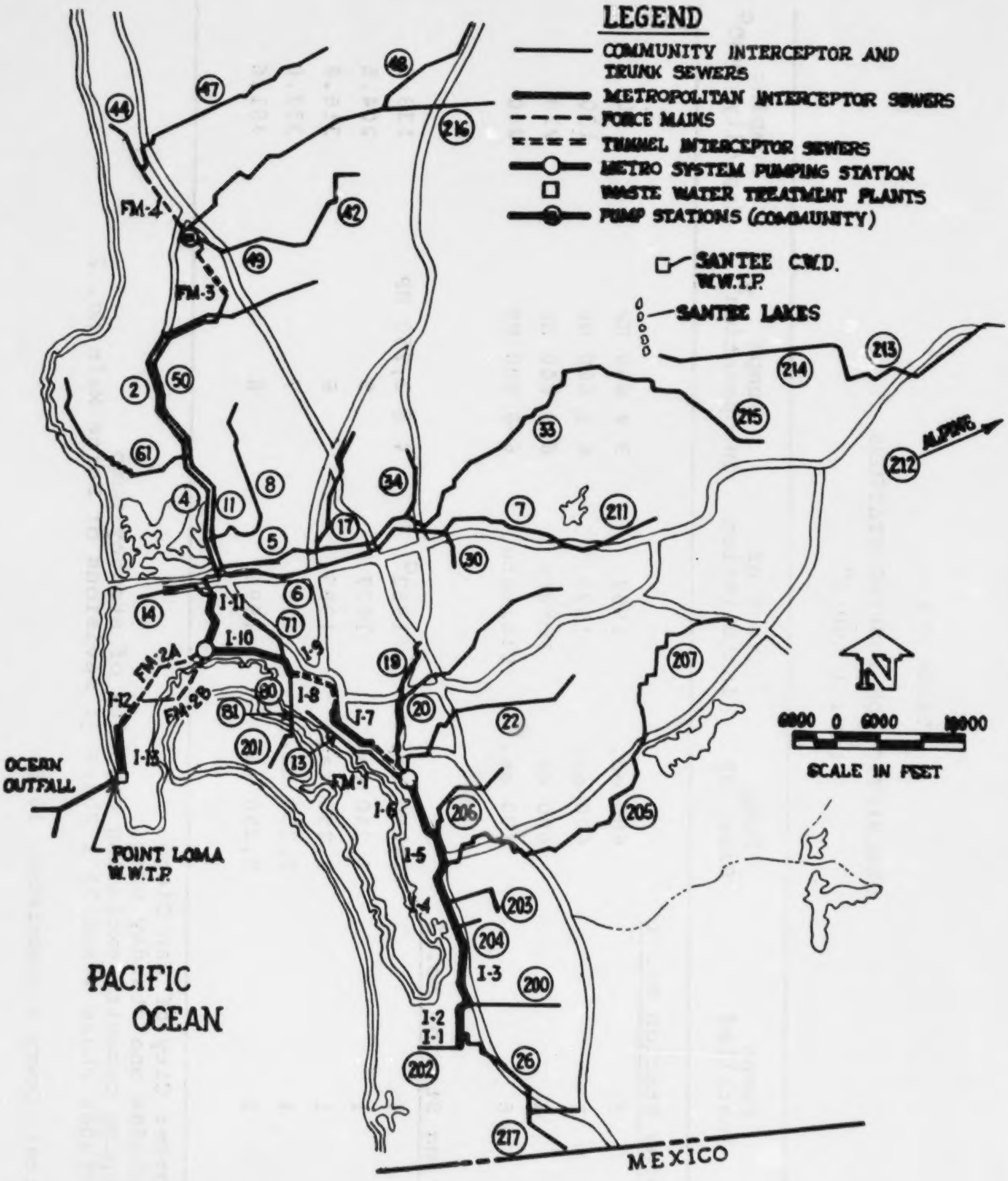
[f] Computed capacity of underlined sizes.

[g] Last date maximim observed flow was measured for the specific sizes underlined.

[h] Present average flow, not maximum observed flow.

[i] No data or flow measurement available.

Source: Lowry & Associates, 1976.



EXISTING SEWERAGE FACILITIES

SAN DIEGO METROPOLITAN FACILITIES PLAN

FIGURE V-2

Source: Lowry & Associates, 1976.

Table V-4

DESCRIPTION OF PUMPING STATIONS
NOS. 1 AND 2[a]

Pumps Installed	Pump Size, HP	Year of Installation	Pumps in Operation[b]	Pumping Capacity, MGD[c]
Pumping Station No. 1				
3	600 ea.	1962	3 @ 600 HP	90
1	600 ea.	1975	4 @ 600 HP	130
2	600 ea.	Future	6 @ 600 HP	220
6	800 ea.	Ultimate	6 @ 800 HP	240
Pumping Station No. 2				
4	2,250 ea.	1962[d]	4 @ 2,250 HP	133.9
1	2,250 ea.	1977	5	204.5
1	2,250 ea.	1985	6	316.8
1	2,250 ea.	1991	7	352.8
1	2,250 ea.	1996	8	381.6

[a] Source: City of San Diego
[b] Includes one standby pump
[c] Pumping capacity excluding capacity of standby pump
[d] Includes Phase I and 1971 Phase II revisions of Force Main No. 2

Source: Lowry & Associates, 1976.

Community Treatment Facilities

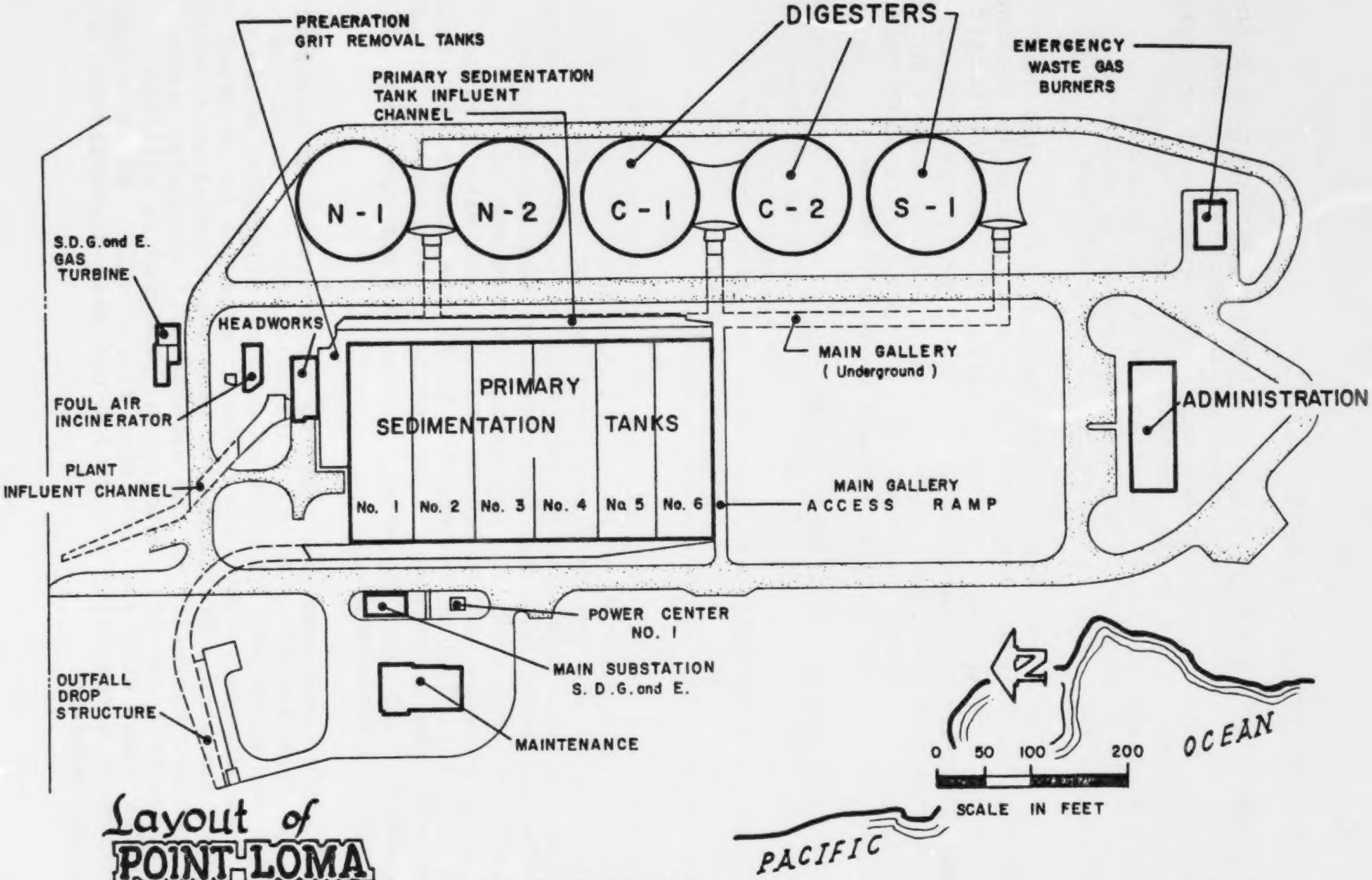
Santee County Water District-Wastewater Reclamation Plant. This plant is located in Sycamore Canyon about 3 miles upstream from the San Diego River. The plant is a conventional activated sludge facility, with a design capacity of 1 mgd. Tertiary treatment consists of three oxidation ponds for extended aeration. The treated effluent is utilized in a series of recreational lakes and for irrigation of golf courses.

Brown Field. The Metropolitan System, as yet, has not reached this area and a very small volume of sewage is treated by a primary Imhoff tank-trickling filter, a secondary Imhoff tank and disposal via percolation. Should Brown Field be converted to the new San Diego International Airport, plans for extending the San Diego Metropolitan Interceptor to link this area with the central facility would be accelerated.

Existing Point Loma Treatment Facility. Figure V-3 is a layout of the existing facilities of the Point Loma treatment plant. Figure V-4 is a schematic diagram of the flow path of this primary treatment facility. Table V-5 lists the design criteria of the plant. The 36-acre plant site is located adjacent to the Cabrillo National Monument.

Preliminary treatment consists of mechanically-cleaned bar screens at Pump Station No. 2. The screenings are ground and returned to the sewage flow. Upon arrival at the Pt. Loma site, the sewage flows through two parallel aerated grit chambers, the operation of which has been less than satisfactory. Subsequent to grit removal, the sewage enters one of six rectangular primary sedimentation basins, each with a rated design capacity of 20 mgd. All the tanks are covered for odor control with the withdrawn gas subjected to a trickling filter, wet scrubber, and odor digestor. Currently, the operation of these towers appears satisfactory.

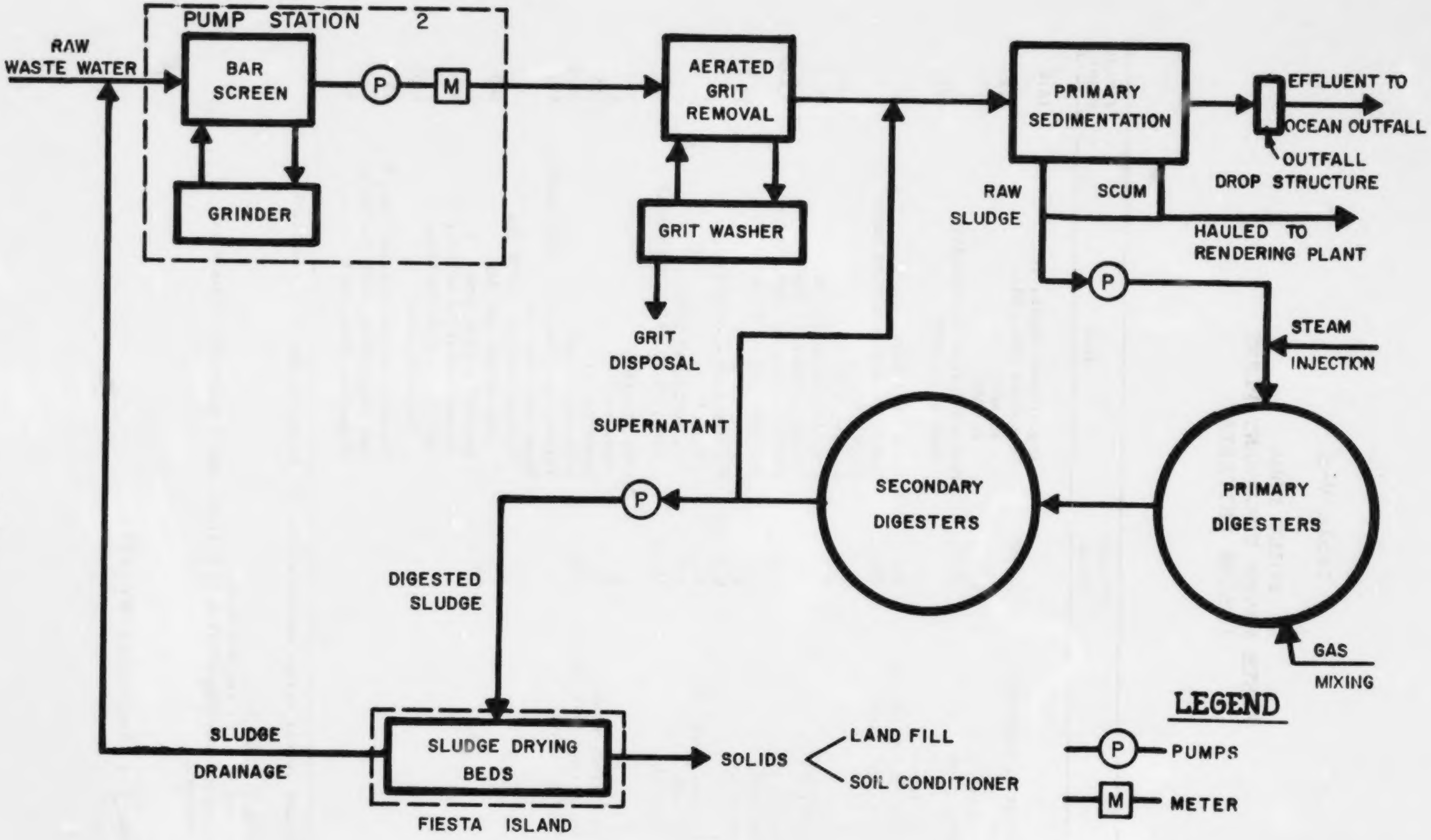
Raw sludge and scum are digested anaerobically in digestors heated by steam and mixed by gas recirculation. Three of the digestors are mixed and function as primary digestors, while two function as secondary digestors. The supernatant is returned to the plant headworks. Problems have been experienced as a result of the improper operation of the aerated grit chambers, necessitating frequent cleaning. Methane gas produced is utilized on-site for fuel, with the remainder flared off. An experimental program of electricity generation has been discontinued due to poor gas quality.



Layout of
POINT LOMA
WASTE WATER TREATMENT PLANT

FIGURE V-3

Source: .Lowry & Associates, 1976.



FLOW—DIAGRAM

POINT LOMA WASTE WATER TREATMENT PLANT

FIGURE V-4

Source: Lowry & Associates, 1976.

Table V-5

POINT LOMA
WASTE WATER TREATMENT PLANT DESIGN CRITERIA[a]

Item	Present Plant
Design Loadings[b]	
Population Equivalent, thousands	1,200
Sewage Flow, MGD	
Average dry weather flow	120
Peak wet weather flow	195
Loadings	
BOD_5, 1,000 lbs/day	300
Suspended solids, 1,000 lbs/day	300
Grit, cu.ft./day (wet basis)	200
Influent Sewer	
Diameter, ft.	9.5
Hydraulic Capacity, MGD	390
Preliminary Treatment	
Raw sewage screening[c]	
Number of screens	3
Channel width, ft.	9.5
Clear opening betw. bars, in.	2
Bar thickness, inch	1/2
Flow range, MGD each	10-65
Communitor	
Number	2
Capacity, cu.ft./hr. each	60
Screenings, cu.ft./day (wet basis)	240
Preaeration and grit removal	
Tanks	
Number	2
Width, ft.	20
Length, ft.	62
Avg. liquid depth, ft.	14.4
Detention time, min.	
at ADWF	3.2
at PWWF	2.1
Maximum Hydraulic Capacity	
Each tank, MGD	97.5
Primary Treatment	
Number of sedimentation tanks[d]	6
Width, ft.	60
Length, ft.	224
Avg. liquid depth, ft.	16.5
Detention time at ADWF, hr.	2.0
Overflow rate at ADWF, gpdpsf	1,488
Maximum hydraulic capacity, each tank, MGD	32.5
Primary scum ejectors	
Number	3
Capacity per unit, gal.	2
Scum, cu.ft./day (wet basis)	200
Sludge Treatment	
Digesters[e]	5
Diameter, ft.	125
Side water depth, ft.	38.5
Volume, ea. digester, 1000 cu.ft.	470
Digesters loadings	
Primary solids, 1,000 lbs dry solids per day	200
Assumed solids conc., %	7
Assumed volatile solids, %	80
Volatile solids loading, lbs/cu.ft./day	0.07
Volatile solids destruction, %	55
Gas production, 1000 cu.ft./hr.	75
Digestion time, days	47

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[a] Design data includes recent design modifications and expansion for 1974 construction.
[b] Estimated.
[c] Located at Pumping Station 2.
[d] 4 existing tanks and 2 under construction.
[e] Includes 3 existing primary digesters N-1, N-2, S-1 and 2 secondary digesters.
Ref: Brown and Caldwell

Source: Lowry & Associates, 1976.

Following digestion, the sludge is pumped to Fiesta Island in Mission Bay Park for reclamation as a soil amendment. The sludge is dewatered on open air drying beds and then mixed with soil to provide topsoil for improvement of the sandy soil at Fiesta Island.

Table V-6 indicates the existing performance of the Pt. Loma Treatment Facility in comparison with the requirements of the NPDES permit. A copy of the permit is contained in Appendix A. The effluent limitations are shown later in this chapter. Indications are that the discharge was meeting the requirements of the order until July 1, 1977, but was out of compliance after that date. Pt. Loma has high overflow rates for its primary sedimentation basins, which results in poor removal of pollutants and short circuiting.

The current average daily flow is approaching the 120 mgd maximum permitted under the NPDES requirements. A recent CPO report indicated that San Diego envisions utilization of chemical coagulant aids to improve the performance of the Pt. Loma facility. The use of these aids will allow operation in excess of the current 120 mgd design capacity. San Diego may apply for a variance of the current permit to allow discharge of more than 120 mgd, average daily flow.

Tijuana, Mexico. Currently, the municipality of Tijuana, Mexico discharges approximately 20 mgd of untreated raw sewage at a point above Rosarito Beach. Plans call for the construction of a wastewater reclamation facility with the effluent to be used for crop irrigation surrounding Rosarita Beach. This facility has yet to be constructed.

Table V-7 shows the expected sewage flows from Tijuana. The population projections represent a median of the various population projections contained elsewhere in this report. It is expected that the sewage flow will continue at approximately 60% of the water consumption.

Tijuana currently operates two pumping stations in series to pump the sewage from Tijuana up and across the mesa to the south of the city. One of these pump stations is located across the border from the intersection of Dairy Mart and Monument Roads. At frequent intervals, the effluent is discharged to a pipe which crosses the border, flows through the Tijuana connector line, and into the San Ysidro interceptor.

Table V-6

PRESENT AND PROJECTED AVERAGE EFFLUENT QUALITY IN COMPARISON TO NPDES PERMIT LIMITATIONS

Wastewater Constituent	Present Primary Effluent	NPDES Effluent Limits	Projected Secondary Effluent	Removal Efficiency (of Secondary Treatment) (percentage)
Flow, mgd	114	120[1]	200	--
BOD$_5$, mg/l	178	30	20	90
Suspended solids, mg/l	121	30	20	85
Settleable solids, mg/l	0.75	0.1	0.09	99+
Grease and oil, mg/l	23.75	10.0	13.06	85
Floating particulates, mg/l	NR	1.0		
pH, units	7.35	6-9	7.5	--
Turbidity, FTU	NR	50.0		80
Arsenic, mg/l	0.001	0.01[2]	$8x10^{-4}$	50
Cadmium, mg/l	0.016	0.020	0.11	70
Chromium, total mg/l	0.051	0.005	0.026	70
Copper, mg/l	0.130	0.200	0.078	80
Lead, mg/l	0.069	0.100	0.059	65
Mercury, mg/l	0.001	0.001	0.0001	74
Nickel, mg/l	0.088	0.100	0.066	35
Silver, mg/l	NR	0.02		80
Zinc, mg/l	0.175	0.300	0.114	70
Cyanide, mg/l	NR	0.1		66
Phenolic compounds, mg/l	NR	0.5		93
Ammonia (NH_3-N), mg/l	NR	40.0		<10
Nitrogen, total -N	NR			
Phosphorous, total -P	NR			
Total chlorinated hydrocarbons (less PCB's), mg/l	ID	0.002		83
Polychlorinated biphenyls, mg/l	NR			90
Toxicity, toxic units	NR	1.5		

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[1] Requirements on flow through turbidity effective July 1, 1977.

[2] Requirements for remainder effective July 1, 1978.

NR Not reported.

ID Insufficient data.

Table V-7

PROJECTED SEWAGE FLOWS - TIJUANA
1970 - 2000

YEAR	POPULATION*	AVERAGE DAILY DRY WEATHER SEWAGE FLOW-MGD
1970	349,034	7.90
1980	646,863	28.46
1990	1,133,328	49.87
2000	1,706,154	86.78

*Population numbers represent medians of the various projections given earlier in this document.

Prior to the construction of the Tijuana connector pipeline, emergency conditions as a result of power outages and/or pump failure resulted in the discharge of untreated sewage into the Tia Juana River, which flows into the Tia Juana Estuary (an area of prime ecological concern). Tijuana will be installing new pumps before mid-1978. After July 1, 1978 flows from Tijuana will be accepted only on an emergency basis.

Tijuana envisions construction of a water reclamation facility which would involve the construction of a secondary activated sludge facility in the vicinity of Cottonwood Creek and the Tijuana River. The effluent from this plant would be used for irrigation of an agricultural preserve. Should the volume of effluent exceed the demand of the agricultural preserve, the water would be pumped to a higher elevation and further east to another agricultural preserve. Construction on this project has not been initiated.

Regardless of the status of this proposed reclamation project, continued provisions to protect the Tia Juana Estuary from emergency discharge of raw sewage from the border pump station is needed. Table V-8 indicates the frequency and duration of the emergency discharge to the San Diego system. There is no flow measurement capacity at the site and charges are based on the frequency of discharge. Tables V-9 and V-10 indicate the quality of the Tijuana sewage discharge.

Table V-8

FREQUENCY AND DURATION OF EMERGENCY DISCHARGES TO SAN DIEGO SYSTEM FROM THE CITY OF TIJUANA WASTEWATER TREATMENT SYSTEM

MONTH	NO. OF PERIODS	HOURS	MINUTES
1975			
January	23	225	35
February	16	38	45
March	11	40	35
April	21	257	05
May	27	337	20
June	35	217	50
July	12	48	10
August	20	25	00
September	17	71	05
October	24	88	35
November	35	152	10
December	22	127	40
	263	1,625	290
1976			
January	9	24	55
February	20	172	45
March	15	26	35
April	23	102	40
May	13	125	25
June	17	47	05
July	15	78	30
August	24	201	30
September	22	118	55
October	27	216	55
November	20	466	55
December	17	566	35
	222	2,158	45
1977			
January	24	338	33
February	19	117	30
March	29	303	45
	72	759	48

Source: City of San Diego, M. W. Auberg.

Table V-9

ANALYSIS OF TIJUANA SEWAGE QUALITY
CESPT*

Constituent: (all in mg/l)	1973	1974						
	12/13	1/18	2/13	6/3	7/11	8/13	9/9	10/11
Total Solids	1532	1118	1370		1440	1280	1390	2110
Volatile Solids	980	360	400		970	650	500	960
Fixed Solids	1152	750	830		470	430	490	1150
Suspended Solids	140	350	360		200	248	240	400
Fixed	50	60	.80		10	36	30	50
Volatile	90	290	280		190	212	210	350
Cyanides	0	0	0.0		0	0	0	0.0
Sulfates	0	.04	0.0		0	0	0	0.0
Grease and Oil	101	99	110		72	84	70	93
Cadmium	1.75	0.25	0.2		1.7	1.9	0.1	1.8
Copper	0.5	0.8	0.2		0	0.2	0.15	0
Hexavalent Chromium	0	0	0.0		.01	0.04	0.27	0
Nickel	0	0	0.0		0	0	0	0.22
Lead	0.6	0.3	0.3		.1	0.1	0.19	0.25
Zinc	2.8	0.4	3.2		.6	0.5	0.4	0.22
BOD (5 day 20°C)	-	3.5	240		320	260	220	400

*Sample collection and analyses by Comision Estatal de Servicios Publicos de Tijuana, B.C.

Source: Lowry & Associates, 1976.

Table V-10

ANALYSIS OF TIJUANA DISCHARGE INTO METROPOLITAN SYSTEM
CITY OF SAN DIEGO WATER UTILITIES DEPARTMENT
1-30-75

Constituents: mg/l unless noted	
pH, units	6.8
Chloride	222
Total Solids	2494
Volatile Solids	1681
Suspended Solids	572
Volatile Solids	412
Calcium	.01
Cobalt	<.02
Chromium, total	<.02
Copper	.12
Nickel	.10
Lead	<.03
Zinc	.08

Source: Lowry & Associates, 1976.

Description of Proposed Wastewater Treatment Facilities

Treatment Processes Considered in the Facilities Plan

In the volumes of the San Diego Metropolitan Facilities Plan and addendum, prepared by Lowry & Associates (1976, 1977), many different treatment processes were examined for possible use at San Diego. This extensive consideration of many possible treatment processes resulted in the listing of some processes which at the present time are not viable because of regulatory requirements; excessive cost, land area or energy requirements; or lack of available technology.

Table V-11 presents an overview of all the processes considered in the Facilities Plan. The process, level of treatment, method of treatment and the advantages and disadvantages are indicated. Additional information on these processes may be gained from the Facilities Plan and from standard reference texts in sanitary engineering.

During initial screening, a number of the processes listed in Table V-11 were dropped from further consideration because of their inappropriateness for inclusion in the San Diego system for the reasons indicated above and in Table V-11 . Those processes which appeared viable are examined in greater detail below. The processes are divided into four steps -- treatment, disinfection, disposal and sludge handling.

Treatment. There are three commonly defined levels of treatment -- primary treatment, secondary treatment and tertiary treatment. Each succeeding level results in a higher quality effluent, but at increased cost and complexity of processing.

Primary Treatment. Primary treatment is a physical settling process, removing between 40 and 60 percent of the suspended solids. The raw sewage enters the plant through a screening device, thence to grit removal and then to the primary sedimentation basin. Normally, this process is used prior to additional treatment. Small amounts of coagulant aids may be added prior to reaching the sedimentation basin to improve settling. The resulting sludge is generally treated by a biological process operating in the absence of oxygen (anaerobic). This process of digestion stabilizes the organic material present in the sludge to reduce the odor and nuisance problem. The process also helps in dewatering. Subsequent to digestion, the sludge is normally dewatered to reduce the

Table V-11

TREATMENT PROCESSES CONSIDERED IN THE FACILITIES PLAN*

PROCESS	LEVEL OF TREATMENT	METHOD OF TREATMENT	ADVANTAGES	DISADVANTAGES
Primary Sedimentation	Primary	Simple sedimentation basins	Small area required Ease of operation Small capital outlay Low operation & maintenance Low energy use	Effluent of poor quality
Roughing Trickling Filters	Intermediate	Biological	Small area required Lower volume of sludge produced Relative ease of operation	Flies & odor nuisance Effluent of poor quality Higher O & M costs
Coagulation-Sedimentation	Intermediate	Chemical coagulation with ferric chloride, alum, lime, or polyelectrolytes	Relative ease of operations Small area required Lime coagulation may afford some disinfection Some removal of iron and phosphorous Small capital outlay	High O & M costs Sludge treatment or disposal difficulties Greater disturbance to surrounding area because of transportation of chemical supply No self-generation capability as in biological process Higher overall energy costs Commitment of natural resources Increase TDS of effluent
Trickling Filters-Low Rate	Secondary	Biological-rock or plastic media	Ease of operation Small volume of sludge Sludge easily treated Effluent nitrified Lower O & M costs Able to handle shock loads Good quality effluent	Head loss through dosing siphon Possible fly & odor nuisance Higher capital cost Requires primary treatment Little or no heavy metals removal
Trickling Filters-High Rate	Secondary	Biological-rock or plastic media	Smaller area than low rate No head loss through dosing siphon Sludge easily treated Low O & M costs Able to handle shock loads	Larger sludge volume than low rate Effluent of lesser quality than low rate Slightly larger sludge volume No nitrification possibilities
Activated Sludge	Secondary	Biological-conventional plug flow, mechanical aeration or diffused air	Good quality effluent Very controllable process Can nitrify Capital cost less than for trickling filter Sludge may have commercial value Relatively low head loss through plant Process is self-replicating Requires no continued addition of large quantities of chemicals Some heavy metals removal	More difficult operation Requires trained operators Susceptible to shock loading Susceptible to toxic compounds Higher O & M costs Larger quantity of sludge produced than trickling filters
Activated Sludge	Secondard	Biological-complete mix, mechanical aeration or diffused air	Less susceptible to shock loads than conventional Sustains somewhat higher loading than conventional	Energy cost for mixing Capital cost for equipment Greater complexity of plant operation
Activated Sludge	Secondary	Biological-Tapered aeration, plug flow	Less air required Less energy costs for pumping	Greater complexity of plant operation

PROCESS	LEVEL OF TREATMENT	METHOD OF TREATMENT	ADVANTAGES	DISADVANTAGES
Activated Sludge	Secondary	Biological-step feed, plug flow aeration	More uniform oxygen demand Greater flexibility for plant operation	Greater complexity of plant operation
Activated Sludge	Secondary	Biological-deep tank	Smaller land area	Greater cost for pumping equipment Higher energy consumption Higher capital cost
Activated Sludge	Secondary	Biological-pure oxygen	Smaller land area Improved sludge characteristics Possibilities for ozonation Reduced sludge volume	Capital cost for oxygen generation Energy required for oxygen generation Safety hazard associated with pure oxygen
Pressure Pipe Treatment	Secondary	Biological	Utilizes existing sewage collection system Very small land area required	Difficult to control sludge removal Lack of equipment designed for this process
Physical-Chemical	Secondary	Coagulation, filtration, and activated carbon adsorption	Good quality effluent Ease of operation Small land area required Small capital cost More effective removal of heavy metals Insensitive to toxic materials	High overall energy use High O & M cost Difficult sludge disposal problem Continued disruption to surrounding community due to transportation of chemical Dangers of chemical storage and use No self-generation as in biological process Commitment of natural resources
Chlorination	Disinfection	Gaseous chlorine addition or hypochlorite addition	Lower energy consumption than ozonation	Requires higher doses when water contains ammonia or organics Effectiveness reduced in turbid waters Relatively unknown effects on virus Results in chlorine residual which is undesirable in a discharge to a water body May form carcinogenic compounds when in combination with organic compounds Requires expensive, accurate flowmeter or a chlorine residual meter to determine dose Toxic effects to plant personnel May require dechlorination facilities
Ozonation	Disinfection	Chemical, ozone addition	Does not react with NH_3 and hence the effectiveness is not reduced More rapid disinfection & hence smaller area required Contributes to dissolved oxygen after breakdown Not thought to contribute carcinogenic compounds Does not require dechlorination facilities	More expensive than chlorine

PROCESS	LEVEL OF TREATMENT	METHOD OF TREATMENT	ADVANTAGES	DISADVANTAGES
Ultraviolet Radiation	Disinfection	Physical, ultraviolet radiation	Does not react chemically with dissolved material Leaves no undesirable residue	High energy consumption Requires plant modification to insure thin sheet flow Very little operational data available Inefficient in turbid water
Sludge Treatment	Stabilization of organics	Biological-Anaerobic digestion	Produces useable methane gas Readily digests primary sludge	Results in a supernatant high in BOD, phosphorous, and COD Heating generally required The digestor is easily upset The sludge volume is greater Susceptible to toxic materials
Sludge Treatment	Stabilization of organics	Biological-aerobic digestion	Easily controlled process Produces smaller volume of sludge Lower capital cost Supernatants low in BOD, COD, phosphorous	Does not generate methane gas Does not operate efficiently on primary sludge
Sludge Treatment	Stabilization of organics	Physical-heat application	Easily controlled Unaffected by toxic materials Improved dewatering characteristics	High O & M High capital cost Supernatant high in BOD
Sludge Treatment	Dewatering	Mechanical-vacuum filtration	Performance independent of weather Moisture content of 60% to 70%	Requires sludge conditioning Energy cost Capital cost O & M cost
Sludge Treatment	Dewatering	Mechanical-centrifugation	No sludge pre-treatment required Ease of operation	High suspended solids in liquid return Energy cost Possible noise problem
Sludge Treatment	Dewatering	Physical-open air drying	No pre-treatment required Ease of operation Small capital cost Small energy use Low O & M cost	Large land area required Possible odor and fly nuisance Possible health hazard
Sludge Treatment	Disposal	Burning	Significantly reduces volume of material Completely reduces organics Allows disposal in areas not otherwise feasible	Capital cost for facilities Possible air pollution problem Energy cost for fuel required
Sludge Treatment	Disposal	Use as soil amendment	Low in capital cost Low O & M cost Some possible cost recovery from sale of sludge	Requires suitable demand Increasing concern over heavy metal buildup and public health hazard
Sludge Treatment	Disposal	Discharge to landfill	Low capital cost Allows possible land utilization	Requires Class II landfill Somewhat high cost for disposal Limited landfill area available

PROCESS	LEVEL OF TREATMENT	METHOD OF TREATMENT	ADVANTAGES	DISADVANTAGES
Sludge Treatment	Disposal	Dump at sea	Low capital cost Low O & M cost No space problems	Unknown effect on marine environment Regulatory agency concern Frequent nuisance as a result of floatable material
Heavy Metals Removal	Advanced treatment	Chemical-high dose lime coagulation	Low capital cost Relative ease of operation Possible lime recovery from sludge	Large volume of sludge Continued cost for chemicals Limited removal efficiency Greater disturbance to surrounding community because of chemical transport Increase in TDS of effluent Generally used for phosphate removal & hardness removal
Heavy Metals Removal	Advanced treatment	Ion exchange	None	Resin binding by residual organics Possible calcium carbonate precipitation Disposal problem for regeneration brine Limited effectiveness Lack of suitable resin
Heavy Metals Removal	Advanced treatment	Reverse osmosis	Very good removal efficiency Energy consumption related to ion concentration	High capital cost High energy consumption High O & M cost Lack of suitable membranes Disposal problem for brines Pre-filtration required
Suspended Solids Removal	Advanced treatment	Filtration-multi-media rapid sand filter	Good removal efficiency	Hydraulic head loss through bed Capital cost O & M cost
		Pressure filters	Good removal efficiency	Capital cost O & M cost Energy use
Desalting	Advanced treatment	Reverse osmosis	Very good removal efficiency Energy consumption related to ion concentration	High capital cost High energy consumption High O & M cost Lack of suitable membranes Disposal problem for brines Pre-filtration required
Nitrogen Removal	Advanced treatment	Ammonia stripping-chemical	Good removal efficiency Does not increase TDS Not susceptible to toxic compounds	High capital cost High O & M cost Requires pH elevation Maintenance difficulties
Nitrogen Removal	Advanced treatment	Biological denitrification	Lower energy consumption	Requires methanol addition Anaerobic process Difficult process to control
Dissolved Organic Removal	Advanced treatment	Activated carbon columns	Does not lose carbon Good removal	Energy cost for carbon regeneration Requires pre-filtration High capital cost
		Powdered carbon	Low capital cost	Continuing cost for carbon Sludge disposal problem

* Lowry and Associates, 1976, 1977

volume. Dewatering increases the solids content from about 2 percent to between 4-6 percent. After this process, the sludge is available for either further treatment via sludge reclamation activities or disposal via a landfill. Figure V-5 is a diagram of a typical primary treatment facility.

Secondary Treatment. Secondary treatment has been defined by the Environmental Protection Agency in terms of removal of suspended solids, biological oxygen demand, and disinfection. More commonly, secondary treatment means primary treatment, which removes settleable solids, followed by further processes which remove additional suspended material as well as dissolved materials. Figures V-5 and V-6 schematically illustrate increasing use of facilities in going from primary to secondary treatment.

Secondary treatment is much more complex than primary treatment and can be accomplished by biological processes or by physical-chemical processes. The two biological processes most commonly used are trickling filters and activated sludge. In trickling filters, a biological community capable of stabilizing wastewater is established on a filter medium and wastewaters flow over the medium. In the activated sludge process, the biological community is part of the sewage mixture in the aeration basin. Oxygen and a portion of the sludge from the secondary clarifier are introduced to the sewage at the beginning of the aeration basin. The sludge introduced acts as a seed in initiating the breakdown of organic material via biological action.

Following either the trickling filter or activated sludge process, the effluent goes through further sedimentation process, the secondary clarifier, where a large portion of the biomass and remaining solid material settles out. A portion of the sludge from this process is returned to the head of the aeration basin and the remainder is treated further. The waste sludge from this process is adaptable to either aerobic (oxygen present) or the previously mentioned anaerobic process. Following digestion, the sludge is disposed of in the same manner as primary sludge.

Tertiary Treatment. Tertiary treatment is generally considered to be any further treatment beyond secondary treatment. Frequently it is a treatment process designed to either improve the quality of the effluent for a specific reuse or to meet a specific discharge requirement. For example, a high ammonia concentration in an effluent might be unacceptable in effluent for discharge into a stream. A process such as ammonia stripping (physical) or denitrification (biological) might be used to remove this constituent.

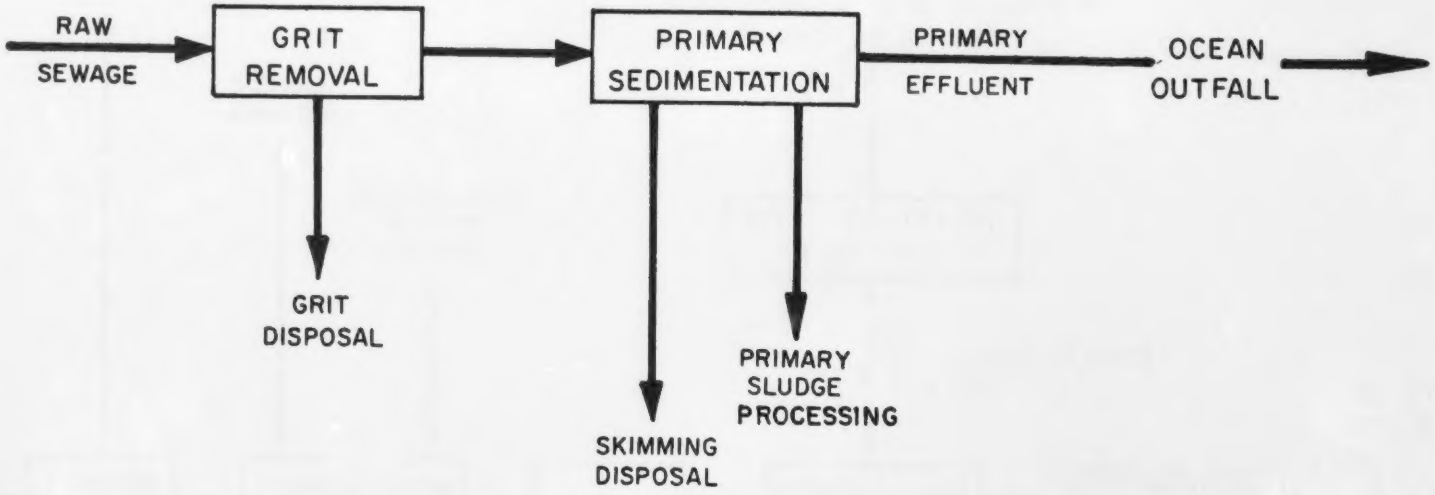
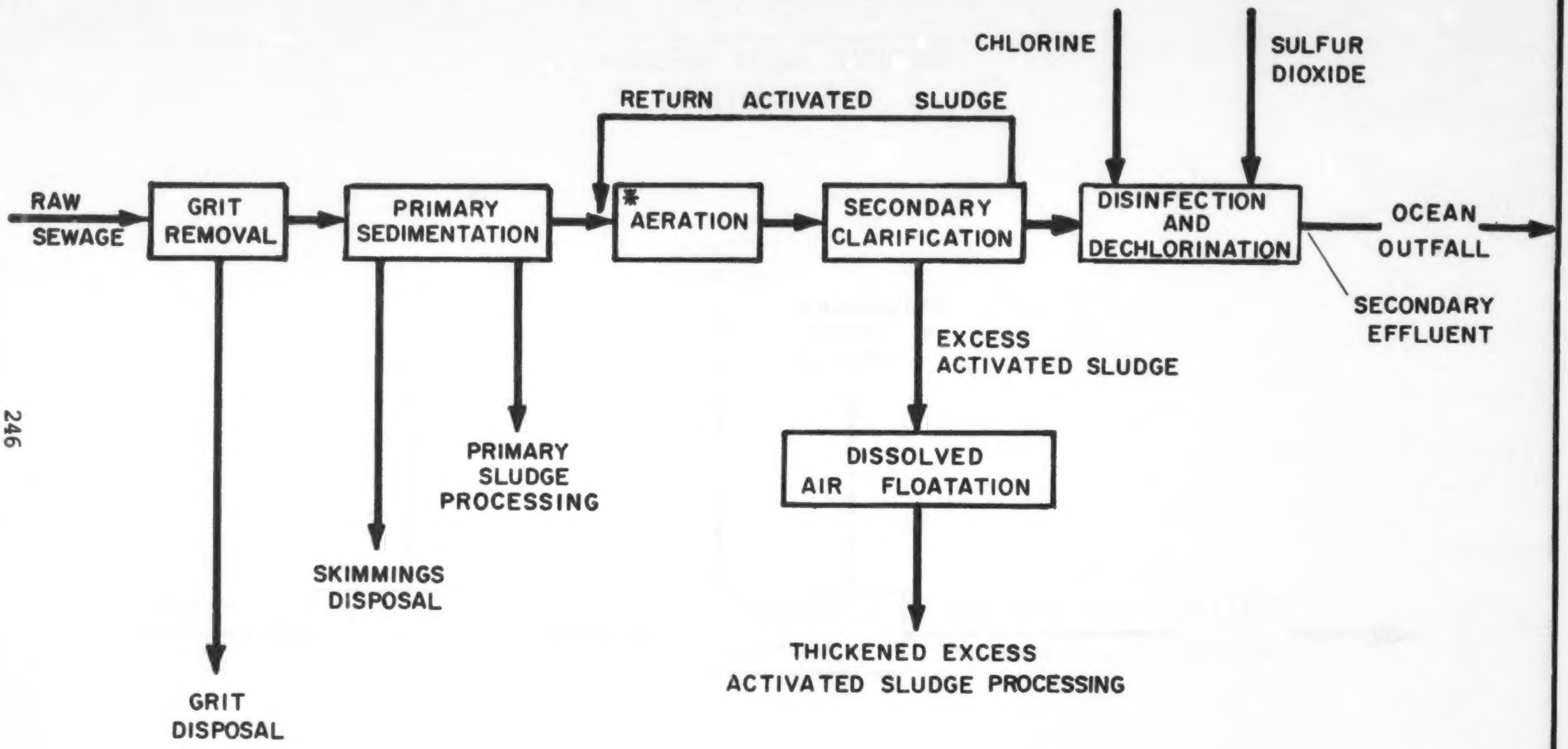


FIGURE V-5
PROCESS FLOW DIAGRAM

PRIMARY TREATMENT

Source: El Wardani, 1977.



ALTERNATE AERATION METHODS *

DIFFUSED AIR
MECHANICAL AERATORS
PURE OXYGEN

FIGURE V-6
PROCESS FLOW DIAGRAM

SECONDARY TREATMENT-ACTIVATED SLUDGE

Source: El Wardani, 1977.

Tertiary treatment may range from removal of a specific component to the complete renovation of an effluent where it is suitable for any reuse. This complete renovation might take the form of primary-secondary treatment followed by coagulation and filtration, ammonia stripping, reverse osmosis, and carbon adsorption. The treatment process for a particular constituent might take the form of a biological process, a chemical precipitation process or an ion exchange process. Various processes for tertiary treatment are contained in Table V-11. The increasing levels of treatment require correspondingly larger capital expenditures, energy use and land area.

Sludge Treatment. Sludge treatment has three phases -- reduction and stabilization of organic compounds, volume reduction, and disposal.

Reduction and stabilization of organic compounds can be accomplished via a biological process or a physical process. The biological processes are differentiated on the basis of oxygen. A process in which oxygen is not present is termed anaerobic. Generally this process features the production of methane gas as a usable byproduct. This process frequently includes heating to speed reactions and takes place in covered reaction vessels. This is the process currently used at Point Loma.

Aerobic digestion requires the presence of oxygen for the bacteria to function. While this process does not produce methane, it results in a smaller volume of digested sludge with improved dewatering characteristics. The aerobic process also results in a supernatant of much lower BOD and suspended solids returned to the plant headworks. The aerobic process is well adapted to a biological sludge (activated sludge process), but does not function as well on a primary sludge.

For a large plant in which the sludge flows are separate for primary and secondary sludges, a good digestion process is anaerobic digestion of the primary sludge and aerobic digestion of secondary sludge. While this entails additional facilities, the methane generation is sufficient to power the aerobic digestion blowers and pumps, and the supernatant has the characteristics of aerobic process.

The physical process utilizes heat and pressure to break down the organic materials. This process requires a high energy use and the supernatant return is high in BOD and suspended solids. However, the process is immune to effects of toxic materials or upsets because of temperature, pH, etc.

Volume reduction is accomplished via a dewatering process in which the percent solids of the sludge is increased. A small percent solids increase will significantly change the volume of sludge to be handled. A sludge containing 5 percent solids occupies twice the volume of a sludge containing 10 percent solids. Dewatering apparatus includes vacuum filtration centrifuges and dewatering beds. While the mechanical dewatering operation requires considerably more energy, a significant savings in land area is afforded.

Disposal of sludge may be accomplished via five means -- land disposal, reclamation, ocean disposal, incineration, and recovery operations.

Generally land disposal would require a Class II sanitary landfill. A Class II landfill implies no connection with the groundwater and no flood danger. In many areas Class II landfill space has limited availability and hence a high cost for this disposal method.

Reclamation activities utilize the sludge as a soil conditioner and amendment. This method of disposal requires a minimum of energy and may afford some cost recovery. However, the available market must be large or it may soon be saturated and another means of disposal needed. Also, there is an increasing public health concern over the possible buildup of toxic materials in the sludge mass.

Ocean disposal is currently practiced in many coastal areas, but increasing regulatory measures indicate the short future of this means of disposal. The heavy metal buildup is of concern, as well as, the surfacing of the sludge and subsequent shore contamination.

Incineration may present a viable disposal alternative particularly in congested areas. The ash remains can be disposed via a Class III landfill as no public health danger is present. In some cases the combined incineration of sludge with combustible refuse may decrease the amount of fuel required. The heat from this process can be utilized for steam generation as a power source. Significant problems associated with this disposal means are air quality and capital and energy costs.

Various product recovery operations, such as pyrolysis, are being evaluated on a pilot project basis. Currently, however, such operations appear to require too much energy to be a viable disposal means.

The amount of sludge varies with the degree and type of treatment. Primary treatment produces about 0.7 tons of sludge after digestion per million gallons of wastewater. Secondary treatment produces about 1.4 tons per million gallons and tertiary treatment about 2.8 tons per million gallons after digestion. Tertiary sludge can be harder to dispose of than secondary sludge since it might contain quantities of chemical coagulant and thus might be less useful for reclamation purposes. If tertiary treatment involves desalinization, there is a highly saline brine which must be discharged.

Disinfection. There are three alternative ways of disinfecting effluent. Dosage with chlorine gas is the most common method and requires about 125 pounds of chlorine per million gallons. Using a sodium hypochlorite solution is another, but more expensive method of disinfection. Ozone gas has been used in other countries, but in the past has rarely been used in the United States.

Using chlorine gas creates potential safety problems. If 200 mgd of effluent were to be disinfected using between 10 and 15 mg/l of chlorine, about 12.5 tons of chlorine would be required each day. At present, no chlorine is manufactured in San Diego so disinfection would require either on-site generation of chlorine or transportation to the site and on-site storage of gas. On-site storage of a 2-day supply of chlorine gas is a potential occupational health and safety hazard in case of accidents or leaks. Bringing chlorine to the site also represents an increase in traffic. The importance of this impact depends upon the location of the treatment facility.

Chlorine is a powerful oxidizing agent, capable of oxidizing many of the compounds in wastewater. Potential products from this oxidation include trace amounts of chemicals known to be carcinogenic and mutagenic. Chlorine is also toxic to wildlife, and chlorine residuals in wastewater would need to be reduced to non-toxic levels prior to discharge to receiving waters. Chemical dechlorination is the usual practice, and would require three tons of sulphur dioxide per day at 200 mgd.

Sodium hypochlorite is a disinfectant closely related to chlorine gas. Sodium hypochlorite is much safer to store; however, it can also oxidize compounds in wastewater to form carcinogens. This method of disinfection is slightly more expensive than chlorine gas.

Ozone as a disinfectant is being more seriously considered in this country. Because ozone breaks down to oxygen, it is extremely safe to use. For the same reason, however, it must be generated on-site. Ozone is an even more powerful oxidizing agent than chlorine. Ozonation is the most expensive and energy intensive of the three disinfection methods. However, the use of ozone as a disinfection method would not require dechlorination facilities.

Effluent Disposal. The effluent of a sewage treatment facility may be disposed of in four ways -- land disposal, river or stream disposal, ocean disposal or reclamation.

Land disposal may take the form of evaporative or percolation methods. Normally evaporative methods are limited to very small flows. Percolation may be used in areas of suitable soil characteristics and area requirements. Normally the percolation of an effluent can be expected to degrade the groundwater quality because of incremental use increases in chemical constituents. However, situations do exist where the use of any out-of-basin water supply might improve the groundwater quality as well as augment the supply. When using percolation as a disposal method, attention should be given to the public health problems associated with chemical characteristics of the effluent.

River or stream disposal of an effluent requires particular attention to the oxygen demand of the effluent, the chemical effects, toxicity to habitat, and public health concern. The river or stream must be examined carefully and considered as a system so that oxygen depletion of the water does not occur. In situations where the effluent may contribute significantly to the volume of water present, the thermal effects must not be overlooked.

Ocean disposal is currently practiced by most coastal agencies. It affords a ready disposal means but in the past has been inadequate to protect marine resources. Insuffient length and depth of the sewage outfall resulted in surfacing of the sewage plume and subsequent contamination of the beaches. Insufficient treatment of the effluent resulted in concerns over possible damage to the environment. If proper precautions are observed, ocean disposal is a viable disposal means.

Wastewater may be suitable for some type of reuse. Primary effluent is suitable for irrigation of fodder though generally discouraged because of plugging of the irrigation system and public health concerns. Highly disinfected secondary effluent may be used for irrigation of processed foods and fodder. The suitability of an effluent for irrigation depends on the salinity and boron tolerance of the crops irrigated in relation to these parameters of the effluent. The nature of the soil must also be taken into consideration for such factors as the sodium adsorption ratio and other characteristics of the effluent.

Should reclamations be utilized as a disposal method facilities should be maintained for either storage of a significant number of days discharge or alternate disposal means. Most current reclaimed water uses involve some form of crop irrigation and will have seasonal variations. Alternative reuse activities such as use for industrial cooling water still require an ultimate disposal means.

Because of public health concerns and lack of public acceptance, direct reuse of reclaimed water as a potable source appears very unlikely.

The Numbered Alternatives of the Facilities Plan

The San Diego Metropolitan Facilities Plan Wastewater Treatment, Reclamation and Disposal 1975-2000 (Lowry & Associates, 1976,) identifies 34 numbered alternatives covering various treatment processes, plant locales, phasing, capacities, outfall locations, sludge disposal techniques and sites, disinfection methods, Tijuana treatment options, reclamation projects, recycling projects, land disposal and no project. These alternatives are presented in Table V-12. Lowry & Associates grouped the alternatives by topic (Groups A through J) for later evaluation. Group C (biological secondary treatment) alternatives are also summarized in Table V-13 which indicates capacity at various plant locales under different alternatives. In 1977 Lowry & Associates added three other alternatives, 35, 36, and 37, which were discussed in an Addendum (1977) to the facilities plan.

In addition to the alternatives considered in Table V-12, a number of alternative plant sites were investigated (Table V-14, Figures V-7, V-8 and V-9), as well as an alternative sludge-disposal site, Miramar. The Naval Training Center was considered as the most likely central city alternative plant site and schematics prepared for the Facilities Plan show the Naval Training Center as the central city plant site choice although other sites continue to be considered. In addition to treatment process and plant site alternatives, the Facilities Plan offered five alternatives (No. 25-29 in Table V-12) to handle flows from Tijuana.

Table V-12

SAN DIEGO ALTERNATIVES FROM FACILITIES PLAN

FACILITIES PLAN ALTER. #	EIR ALTER. #	DESCRIPTION	COMMENTS	FURTHER CONSIDERATIONS
Primary				
Group A				
1	1	Expand Pt. Loma to 200 MGD/no change in design	Will not meet requirements of P.L. 92-500	No
2	2	Expand Pt. Loma to 200 MGD/improved design	Will not meet requirements of P.L. 92-500	No
Primary-Chemical				
Group B				
3	3	Convert Pt. Loma to 200 MGD chemical coagulation ferric or alum	Will not meet requirements of P.L. 92-500	No
4	4	Convert Pt. Loma to 200 MGD chemical coagulation high dose lime	Will not meet requirements of P.L. 92-500	No
Biological Secondary				
Group C				
5	5	Convert Pt. Loma to 200 MGD biological treatment plant, continue use of Pt. Loma outfall	Insufficient room at Pt. Loma without extensive earthwork, unacceptable to regulatory agencies	No
6	6	Convert Pt. Loma to 200 MGD physical/chemical secondary treatment plant or continue use of Pt. Loma outfall	Insufficient room at Pt. Loma without extensive earthwork, unacceptable to regulatory agencies; high overall energy and O & M costs	No
7	7	Convert Pt. Loma to 120 MGD biological secondary treatment, add 100 MGD biological secondary treatment at central San Diego; continue use of Pt. Loma outfall	Insufficient room at Pt. Loma without earthwork which may be unacceptable to regulatory agencies	Yes
8	8	Convert Pt. Loma to 120 MGD biological secondary treatment; build an additional 85 MGD biological secondary treatment facility and ocean outfall in South Bay area; continue use of Pt. Loma outfall	Insufficient room at Pt. Loma without earthwork which may be unacceptable to regulatory agencies; additional cost of ocean outfall	Yes
9	9	Construct a new 120 MGD biological secondary treatment facility at Naval Training Center (NTC); construct an 85 MGD biological secondary treatment facility and ocean outfall in the South Bay area; continue use of Pt. Loma outfall	Objections to use of Navy land at NTC; additional cost for ocean outfall	Yes
10	10	Convert Pt. Loma to 45 MGD; construct a new 105 MGD facility at NTC; construct a new 50 MGD treatment plant and ocean outfall in the South Bay area; continue to use the Pt. Loma outfall	Objections to use of Navy land at NTC; additional cost for ocean outfall	Yes

FACILITIES PLAN ALTER. #	EIR ALTER. #	DESCRIPTION	COMMENTS	FURTHER CONSIDERATIONS
Group C (Cont.)				
11	11	Construct a new 150 MGD biological secondary treatment facility at NTC; construct an additional 50 MGD biological secondary treatment facility and ocean outfall at South Bay; continue use of the Pt. Loma outfall	Objections to use of Navy land at NTC; additional cost for ocean outfall; possible lack of sufficient area at NTC	Yes
12	12	Convert the existing Pt. Loma facility to 100 MGD biological secondary; construct an additional 85 MGD biological secondary facility at NTC; construct a 15 MGD biological secondary facility and ocean outfall in the North City area	Requires construction of an additional ocean outfall for a small flow	No
13	13	Convert the existing Pt. Loma plant to biological secondary with capacity of 100 MGD; construct a new 85 MGD biological secondary facility and ocean outfall in the South Bay area; construct a new 15 MGD biological secondary facility and ocean outfall in the North City area	Requires construction of two ocean outfalls	No
14	14	Construct a new 200 MGD treatment plant at a central location; continue use of Pt. Loma outfall	Requires large centrally located parcel of land	No
15	15	Construct a new 200 MGD biological secondary treatment facility and ocean outfall in the South Bay area		
Secondary-Physical Chemical				
Group D				
16		Source control of heavy metals; physical/chemical treatment and de-ionization treatment of flow	Does not comply with P.L. 92-500; overall energy consumption for physical/chemical treatment and de-ionization are high	No
Sludge Treatment				
Group E				
17		Continue reclamation of aerobically digested sludge with open air drying at Fiesta Island; establish sludge drying/reclamation/disposal at another location	Possible future public health concerns over Fiesta Island operation; possible future concern with heavy metals buildup in sludge	Yes
18		Continue reclamation of anaerobically digested sludge by open air drying at Fiesta Island; establish reclamation of sludge by direct liquid application at another location	Possible future public health concerns over Fiesta Island operation; possible future concern with heavy metals buildup in sludge	Yes

FACILITIES PLAN ALTER. #	EIR ALTER. #	DESCRIPTION	COMMENTS	FURTHER CONSIDERATION
Group E				
19		Dispose of digested and/or raw sludge by incineration	Air pollution problems; high capital cost; energy cost for fuel	No
20		Resources recovery from sewage sludge by pyrolytic process	High energy consumption; high capital cost; high O & M cost; lack of suitable equipment	No
21		Co-disposal of sewage sludge with municipal solid wastes	Requires higher class landfill; utilizes valuable landfill space; no reclamation possible	No
Disinfection				
Group F				
22		Disinfection of effluent by gas chlorination	Toxicity of chlorine; possible formation of carcinogenic compounds; adverse environmental effects of residual chlorine; requirement dechlorination; possible hazards in transportation; reaction with organics and NH_3 which reduces effectiveness	Yes
23		Disinfection of effluent by on-site generated hypochlorite solution	Same problems as with gas chlorination except for reduced transportation hazard	Yes
24		Disinfection by ozone	High energy consumption	Yes
Tijuana				
Group G				
25		Continue present arrangements for Tijuana emergency flow	Emergency flow exists on a daily basis. Future lack of capacity for Tijuana flow	Yes
26		Locate flow equalization facilities at border to store emergency raw sewage discharges by Tijuana and drain to San Diego system during low flow	Sewage would be septic creating possible odor and pipe problems	Yes
27		Locate flow storage facilities at border for Tijuana emergency flow for subsequent disposal via Mexican system	Mexican system does not treat possible odor problem; emergency flows exist on a daily basis; large storage capacity might be necessary	No
28		Provide secondary treatment facility and ocean outfall for Tijuana	Large capital expenditure for facility	Yes

FACILITIES PLAN ALTER. #	EIR ALTER. #	DESCRIPTION	COMMENTS	FURTHER CONSIDERATIONS
Group G				
29		Split Metropolitan system with one of the treatment facilities located in South Bay area; joint utilization of treatment facilities and ocean outfall	Tijuana portion of treatment facilities not grant fundable	Yes
Reclamation/Recycling				
Group H				
30		Establish "satellite wastewater reclamation" program	High energy, capital and O & M costs; lack of suitable market for reclaimed water	Yes
31		Establish "live-stream wastewater reclamation" program	High energy, capital and O & M costs; environmental impacts, public health concerns; possible groundwater degradation	Yes
32		Establish program of recycling reclaimed water to municipal water supply system	High energy, capital and O & M costs; public health concern over virus removal; currently unlawful	No
Land Disposal				
Group J				
33		No project	Violates NPDES permit; violates P.L. 92-500; would cause connection ban and/or subsequent legal action against San Diego	No

Alternative
35, 36, & 37
See Table V-18

Table V-13

VOLUMES OF SEWAGE TREATED AT VARIOUS SITES UNDER GROUP C (BIOLOGICAL SECONDARY) ALTERNATIVES

Volumes in MGD

Alternative No.	Point Loma Site	Central City Site	South Bay Site	North City Site
5	200	0	0	0
6	200	0	0	0
7	100	100	0	0
8	115	0	85	0
9	0	115	85	0
10	45	105	50	0
11	0	150	50	0
12	100	85	0	15
13	100	0	85	15
14	0	200	0	0
15	0	0	200	0

Alternative Treatment Plant Sites

Table V-14

Point Loma - Present Treatment Plant Site
Point Loma - California Western University Campus
Point Loma - La Playa Site
Naval Training Center Site
Loma Portal Site - Between Midway Drive and Pacific Highway
Mission Bay Park - Fiesta Island Site
Mission Bay Park - Adjacent to West Point Loma Boulevard
Ocean Beach Site
Andrade Park Site - Mission Valley Along Friars Road West of Harney Street
Midway Site - Adjacent to Sports Arena
Naval Station Site - Adjacent to Pumping Station No. 1
North Island Naval Air Station
Palm City - Palm City Sanitation District Plant Site
Nestor Site - Between Saturn Boulevard and Greenbay Street
Tijuana Valley Site - Sunset Avenue and 27th Street at I-5
Tijuana Valley Site - Imperial Beach Naval Air Station (Ream Field)
Tijuana Valley Site - Hollister Avenue and Monument Road
Tijuana Valley Site - Dairy Mart Road
Sorrento Valley Site - North City
Additional Satellite Plant Sites

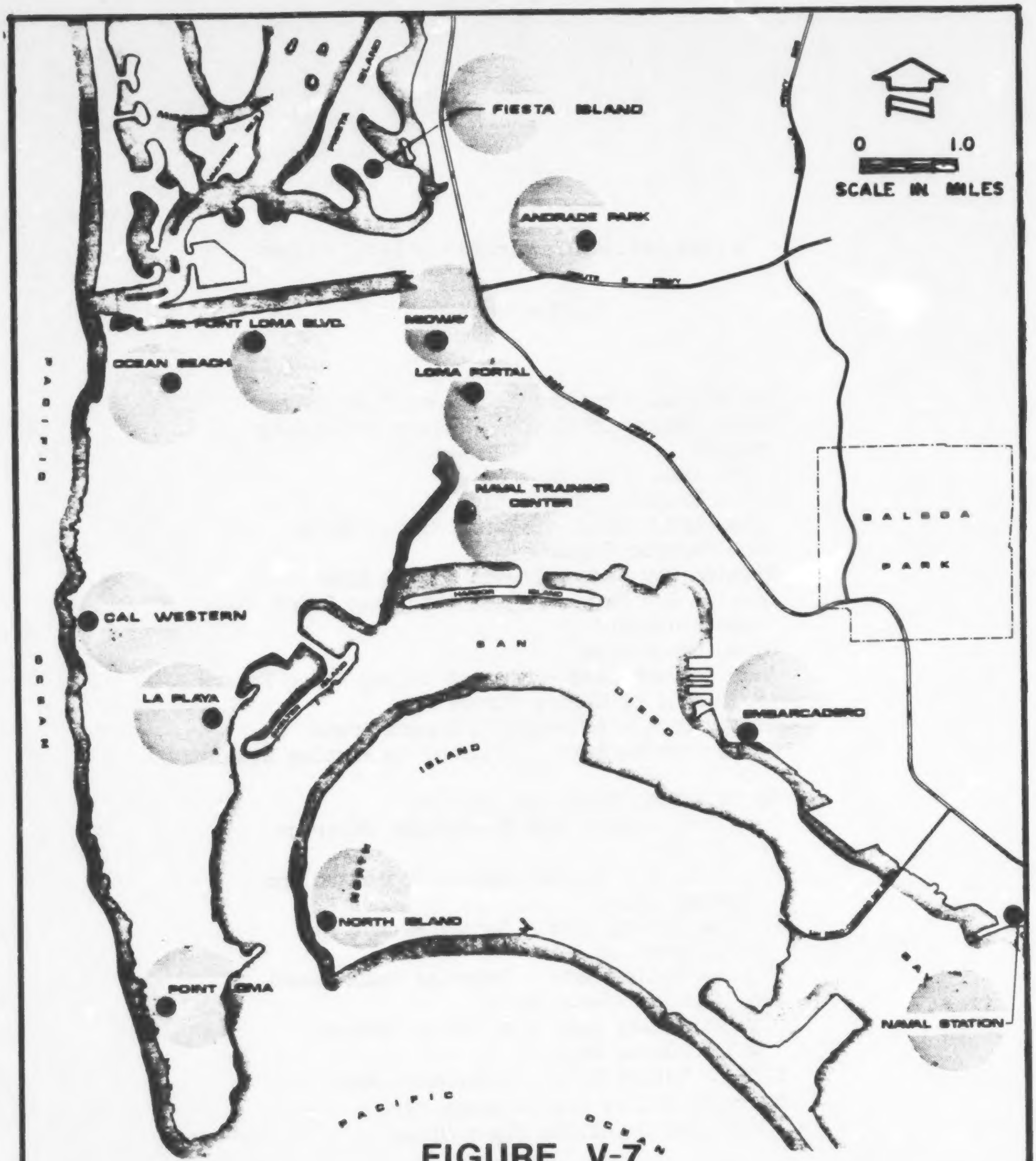


FIGURE V-7
ALTERNATIVE
SEWAGE TREATMENT PLANT SITES

CENTRAL AREA

Source: Lowry & Associates, 1976.

Views of the proposed
NTC site from atop the
Metro Pumping Station No. 2.

CENTRAL SAN DIEGO SITE ALTERNATIVES

Loma Portal area.
Main Post Office in
background to the
southwest.

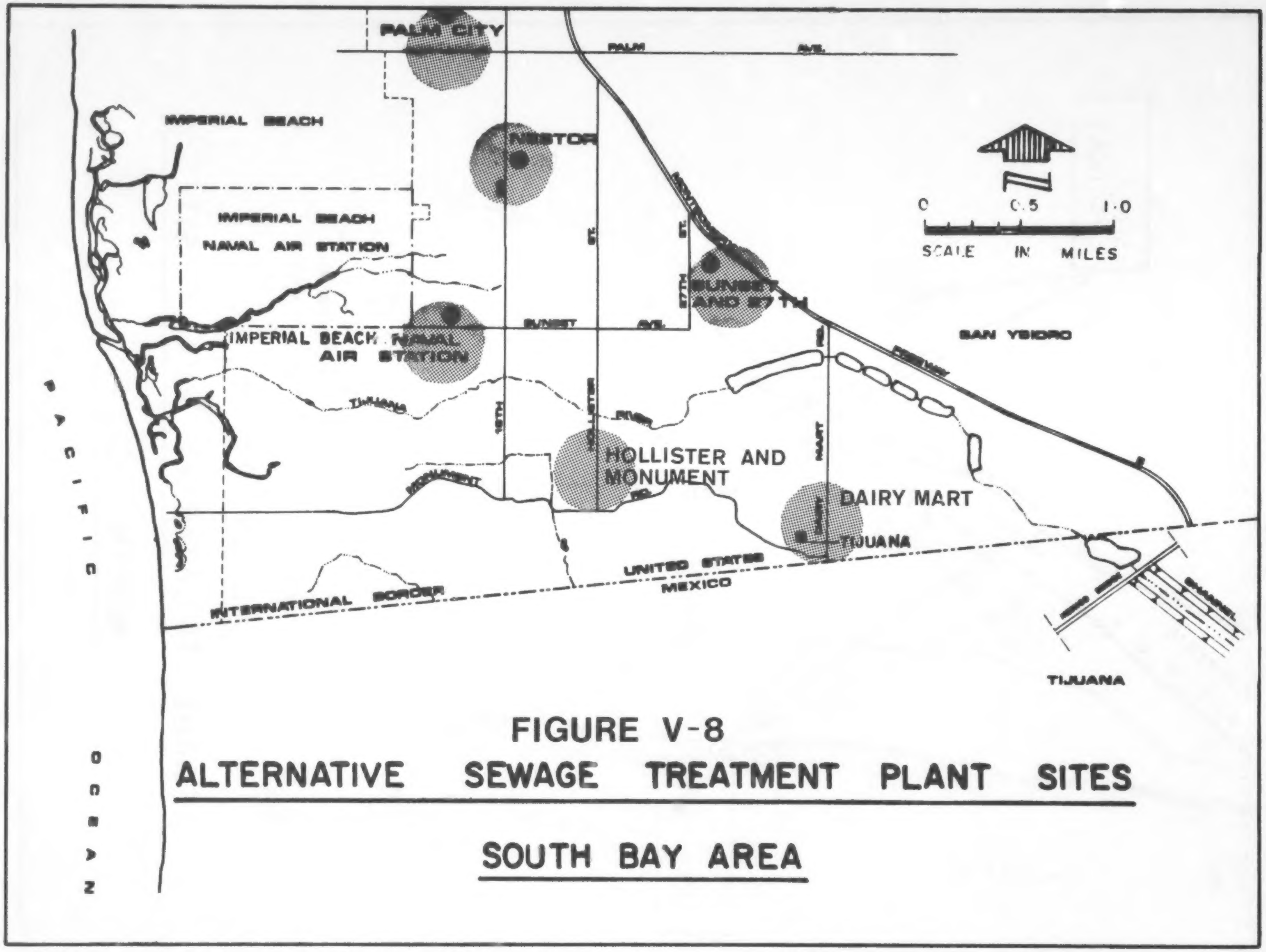


FIGURE V-8
ALTERNATIVE SEWAGE TREATMENT PLANT SITES

SOUTH BAY AREA

Source: Lowry & Associates, 1976. Modified to show additional plant sites from Lowry & Associates, 1977.

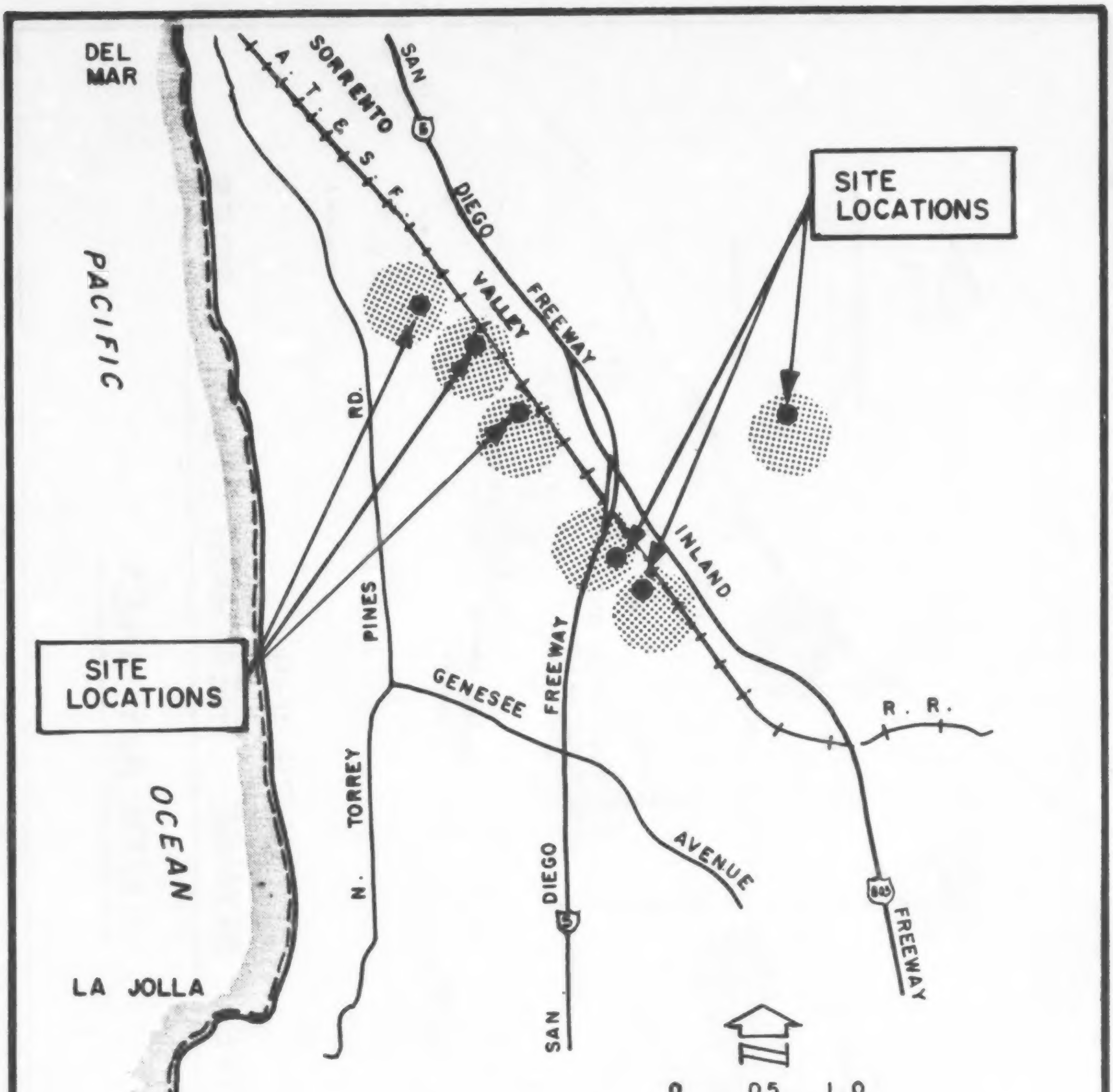


FIGURE V-9
ALTERNATIVE
SEWAGE TREATMENT PLANT SITES
NORTH CITY

Source: Lowry & Associates, 1976.

Reclamation/recycling alternatives were presented in the Facilities Plan in the form of a satellite wastewater reclamation program (No. 30), a live-stream wastewater reclamation program (No. 31) and a recycling of reclaimed water to municipal water supply systems (No. 32). Although these alternatives were discussed in the Facilities Plan, they are not considered part of the expansion of treatment capacity program and represent future programs that are to be investigated more fully at a later time. They were considered in the plan because of its time frame (25 years) and because facilities proposed for construction at this time should be compatible with future plans. Land disposal of the total effluent (No. 33) was also listed as an alternative.

Considering the number of alternatives offered for liquid waste treatment, disinfection, effluent disposal, sludge handling, site location and Tijuana effluent and the number of combinations of alternatives that could be assembled into programs or systems, the less viable alternatives needed to be eliminated before evaluations continued. An elaborate screening and ranking process was developed by Lowry & Associates in the Facilities Plan to evaluate the alternatives. A citizens' advisory committee independently ranked sites for treatment and reclamation facilities (Appendix C). In the preparation of this EIS, some less viable alternatives were eliminated (Table V-12, Column 5). The general criteria used by all the evaluators in ranking and/or screening the alternatives are described briefly at the end of this chapter. The "Comments" and "Further Considerations" columns of Table V-12 indicate which of the numbered alternatives were considered viable enough to warrant further consideration. Sites to be investigated further included Point Loma, Naval Training Center, Loma Portal, Midway, Naval Station, Palm City, Imperial Beach Naval Air Station, Sunset and 27th Street, Dairy Mart Road, and Hollister Avenue and Monument Road.

Alternative Wastewater Systems

The discussion thus far has treated alternatives regarding liquid treatment, disinfection, effluent disposal, sludge handling, site location and Tijuana. All of these facets must be combined into systems. The systems treated in the Facilities Plan examined a viable alternative from each category of Table V-12. Each system examined included both the immediate facilities to be constructed, as well as conceptual provisions for various future water reclamation activities.

Table V-15 summarizes the principal features of Systems A-E as presented in Volume 4 of the Facilities Plan and Alternatives 35, 36 and 37 as presented in the Addendum to the Facilities Plan. Alternatives 35, 36 and 37 are presented here with the systems, for like the systems they contain all the elements of a total metropolitan core system, including sludge processing and reclamation. The system designations are those utilized in the Facilities Plan and Addendum; should additional information regarding particular features of individual systems be required, reference should be made to those documents.

System A. Features of System A (Figure V-10) include retention of a 150 mgd primary treatment facility at Point Loma, continuation of the present sludge disposal method at Fiesta Island, construction of a 13 mgd reclamation facility at Naval Training Center, further investigation into a larte-scale water reclamation plan, and construction of a 70 mdg biological secondary facility and ocean outfall for Tijuana.

Because this system does not comply with provisions of PL 92-500 regarding secondary treatment, it was not seriously considered in this document.

System B. Figure V-11 is a schematic representation of the components and locations of this system. Principal features of this system are construction of a 100 mgd biological secondary facility at Point Loma and a 50 mgd biological secondary facility at the Naval Training Center. Both of these facilities would be constructed immediately with an additional 50 mgd facility to be constructed at the Naval Training Center at a later date. The current sludge disposal methods would be continued with provisions for an alternate facility at Miramar Naval Air Station. An investigation would be made into wastewater reclamation programs. A 70 mgd facility would be constructed in the South Bay to serve Tijuana. Because of the extensive earthwork necessary at the Point Loma site and objections by the California Coastal Commission and Cabrillo National Monument, this system has received little consideration.

System C. Principal features of System C (Figure V-12) would be the location of a 110 mgd biological secondary sewage treatment plant at the Naval Training Center adjacent to Pumping Station No. 2. An additional 40 mgd biological secondary treatment facility would be located at 27th and Sunset in the Tia Juana River Valley. At the same 27th and Sunset location, a 40 mgd biological secondary treatment facility would be constructed to serve Tijuana. In 1987, an additional 40 mgd of capacity would be provided at the Naval Training Center, and 40 mgd at 27th and Sunset (10 mgd for San Diego and 30 mgd for Tijuana).

Alternative Systems of the Facilities Plan and Addendum

Table V-15

FACILITIES PLAN DESIGNATION	EIR DESIGNATION	TREATMENT ALTS.	SLUDGE ALTS.	DISINFECTION ALTS.	TIJUANA ALTS.	OUTFALL LOCATIONS	PLANT LOCATIONS	PRINCIPAL CONCERNS
System A	N.C.	1	17	None	28	Pt.Loma, South Bay	Pt.Loma,South Bay	Does not comply with P.L. 92-500
System B	N.C.	7+	17	23	28	Pt.Loma, South Bay	Pt.Loma, South Bay, NTC	Excessive earthwork at Pt. Loma
System C	16	11	17	23	29	Pt.Loma, South Bay	South Bay, NTC	Cost of additional outfall
System D	N.C.	12+	17	23	28	Sorrento Valley, Pt. Pt.Loma, South Bay	Sorrento Valley Pt.Loma,South Bay, NTC	Cost of additional outfall
System E	N.C.	14+	17	23	28	Pt.Loma, South Bay	NTC, South Bay	Possible conflict over land use at NTC
35-Phase I	16-A	*+	17	None	28	Pt.Loma, South Bay	Pt.Loma, Hollister,Dairy Mart	Duplication of facilities at Hollister & Dairy Mart sites; lack of land at NTC; regulatory concerns over phasing.
35-Phase II			17	None	28	Pt.Loma, South Bay	NTC, Hollister, Dairy Mart	
36-Phase I	16-B	*+	17	None	28	Pt.Loma, South Bay	Pt.Loma, Hollister, Dairy Mart	Possible duplication of facilities at Hollister & Dairy Mart sites
36-Phase II			17		28	Pt.Loma, South Bay	NTC, Hollister, Pt.Loma,DairyMart	
37-Phase I	16-C	*	17	None	29	Pt.Loma,South Bay	Pt.Loma,Hollister	Possible lack of land at NTC
37-Phase II			17		29	Pt.Loma,South Bay	NTC,Hollister	

+ Designates provision of separate 70 MGD facility for Tijuana
* These treatment alternatives were not considered in the Facilities Plan.

N.C. - Not Covered

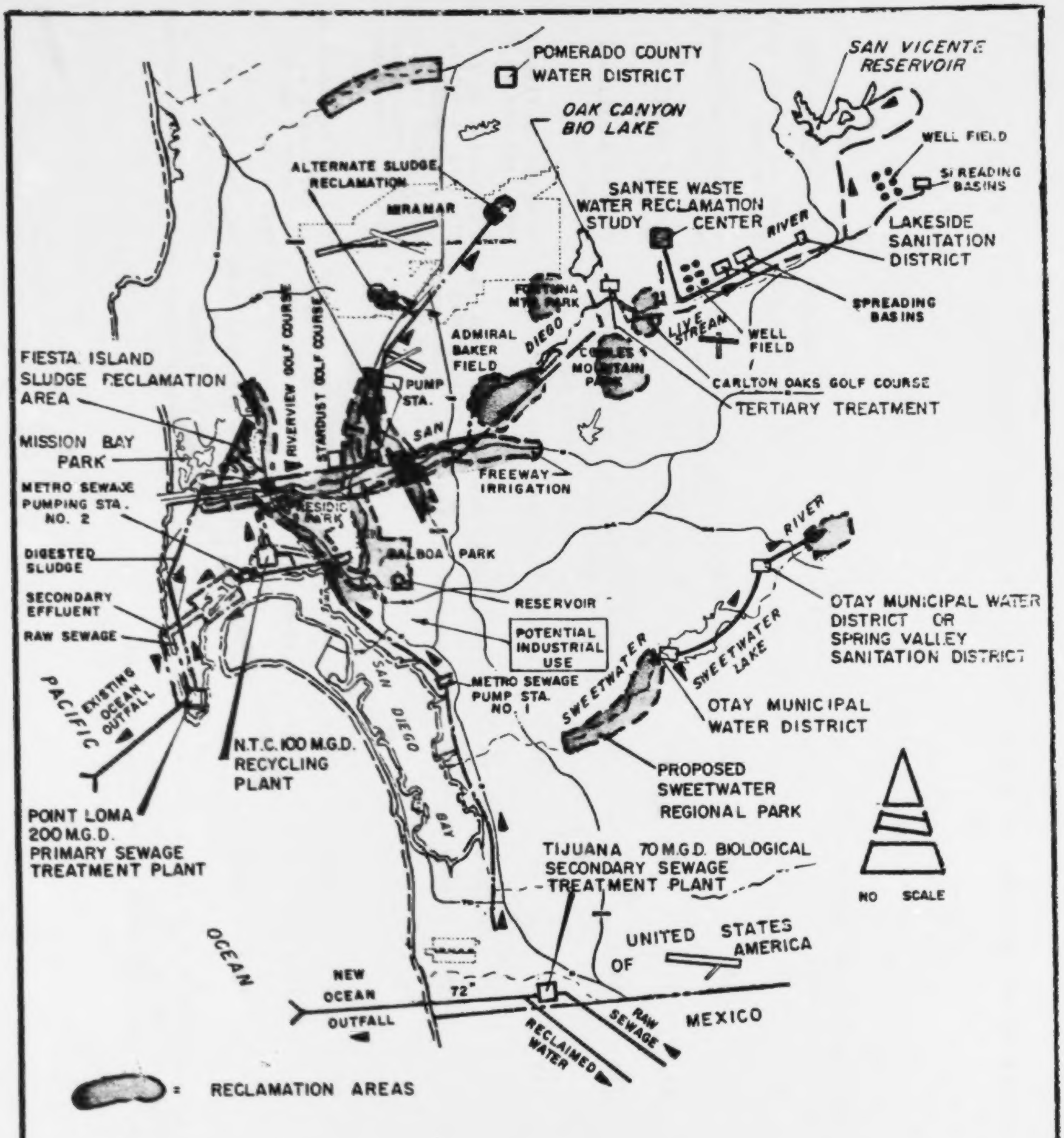


FIGURE V-10
ALTERNATIVE SYSTEM A

LOCATION OF FACILITIES

Source: Lowry & Associates, 1976.

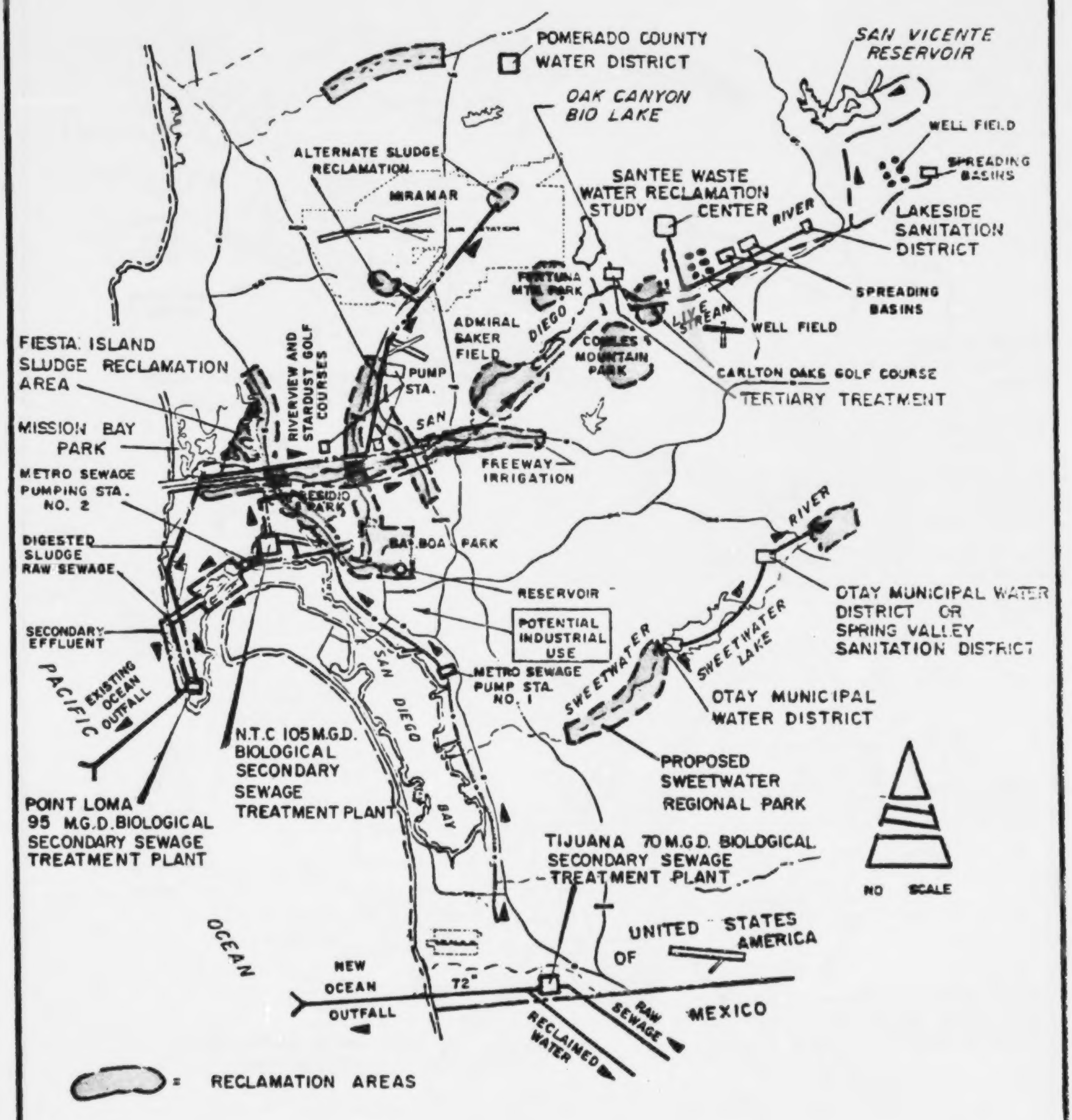

POMERADO COUNTY WATER DISTRICT
SAN VICENTE RESERVOIR
OAK CANYON BIO LAKE
WELL FIELD
SPREADING BASINS
ALTERNATE SLUDGE RECLAMATION
MIRAMAR
SANTEE WASTE WATER RECLAMATION STUDY CENTER
RIVER
LAKESIDE SANITATION DISTRICT
FORTUNA MTN. PARK
SPREADING BASINS
LIVE STREAM
WELL FIELD
ADMIRAL BAKER FIELD
DIEGO
COWLES MOUNTAIN PARK
CARLTON OAKS GOLF COURSE
TERTIARY TREATMENT
FIESTA ISLAND SLUDGE RECLAMATION AREA
RIVERVIEW AND STARDUST GOLF COURSES
PUMP STA.
SAN
MISSION BAY PARK
FREEWAY IRRIGATION
METRO SEWAGE PUMPING STA. NO. 2
PRESIDIO PARK
DIGESTED SLUDGE
RAW SEWAGE
BALBOA PARK
RIVER
RESERVOIR
OTAY MUNICIPAL WATER DISTRICT OR SPRING VALLEY SANITATION DISTRICT
SECONDARY EFFLUENT
POTENTIAL INDUSTRIAL USE
SWEETWATER
SWEETWATER LAKE
PACIFIC
EXISTING OCEAN OUTFALL
SAN DIEGO BAY
METRO SEWAGE PUMP STA. NO. 1
OTAY MUNICIPAL WATER DISTRICT
PROPOSED SWEETWATER REGIONAL PARK
N.T.C 105 M.G.D. BIOLOGICAL SECONDARY SEWAGE TREATMENT PLANT
POINT LOMA 95 M.G.D. BIOLOGICAL SECONDARY SEWAGE TREATMENT PLANT
TIJUANA 70 M.G.D. BIOLOGICAL SECONDARY SEWAGE TREATMENT PLANT
NO SCALE
OCEAN
UNITED STATES OF AMERICA
NEW OCEAN OUTFALL
72"
RAW SEWAGE
RECLAIMED WATER
MEXICO
= RECLAMATION AREAS

FIGURE V-11
ALTERNATIVE SYSTEM B

LOCATION OF FACILITIES

Source: Lowry & Associates, 1976.

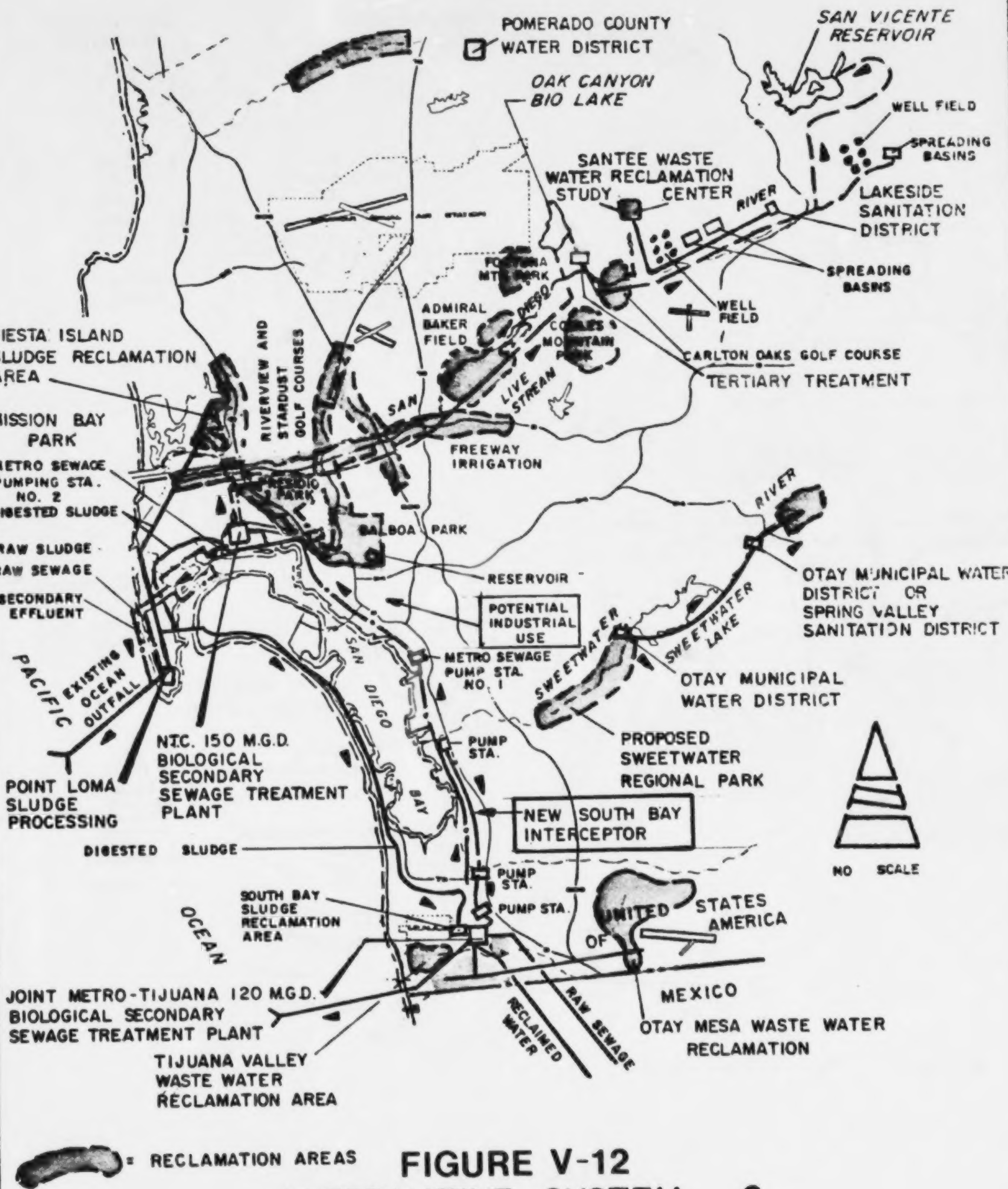

POMERADO COUNTY WATER DISTRICT
SAN VICENTE RESERVOIR
OAK CANYON BIO LAKE
WELL FIELD
SPREADING BASINS
SANTEE WASTE WATER RECLAMATION STUDY CENTER
RIVER
LAKESIDE SANITATION DISTRICT
FORTUNA MTN PARK
SPREADING BASINS
ADMIRAL BAKER FIELD
DIEGO
COWLES MOUNTAIN PARK
WELL FIELD
CARLTON OAKS GOLF COURSE
TERTIARY TREATMENT
FIESTA ISLAND SLUDGE RECLAMATION AREA
RIVERVIEW AND STARDUST GOLF COURSES
SAN
LIVE STREAM
MISSION BAY PARK
FREEWAY IRRIGATION
METRO SEWAGE PUMPING STA. NO. 2
PRESIDIO PARK
DIGESTED SLUDGE
BALBOA PARK
RIVER
RAW SLUDGE
RAW SEWAGE
RESERVOIR
OTAY MUNICIPAL WATER DISTRICT OR SPRING VALLEY SANITATION DISTRICT
SECONDARY EFFLUENT
POTENTIAL INDUSTRIAL USE
SWEETWATER
SWEETWATER LAKE
PACIFIC
EXISTING OCEAN OUTFALL
METRO SEWAGE PUMP STA. NO. 1
SAN DIEGO BAY
OTAY MUNICIPAL WATER DISTRICT
SWEETWATER
PROPOSED SWEETWATER REGIONAL PARK
PUMP STA.
N.T.C. 150 M.G.D. BIOLOGICAL SECONDARY SEWAGE TREATMENT PLANT
POINT LOMA SLUDGE PROCESSING
NEW SOUTH BAY INTERCEPTOR
DIGESTED SLUDGE
NO SCALE
PUMP STA.
PUMP STA.
SOUTH BAY SLUDGE RECLAMATION AREA
OCEAN
UNITED STATES OF AMERICA
MEXICO
JOINT METRO-TIJUANA 120 M.G.D. BIOLOGICAL SECONDARY SEWAGE TREATMENT PLANT
RECLAIMED WATER
RAW SEWAGE
OTAY MESA WASTE WATER RECLAMATION
TIJUANA VALLEY WASTE WATER RECLAMATION AREA
= RECLAMATION AREAS

FIGURE V-12
ALTERNATIVE SYSTEM C
LOCATION OF FACILITIES

Source: Lowry & Associates, 1976.

A new 84-inch ocean outfall extending 16,000 feet offshore would be constructed from the mouth of the Tia Juana River.

The present sludge treatment and disposal method involving anaerobic treatment of digested sludge at Point Loma, with subsequent disposal at Fiesta Island, would be continued. Should difficulties arise with this disposal method, provision would be made for a sludge force main to the Tia Juana River Valley for open air drying and soil amendments. Provisions are included in the system for future reclamation activities.

On-site hypo-chlorination generation could be used to disinfect effluent at the Naval Traininc Center site because of the difficulties in transporting chlorine gas. Gas chlorination would be used at the South Bay site.

Provisions for Tijuana under this alternative involve the construction of a parallel treatment system of a biological secondary level on the same site as the San Diego Metropolitan System. The advantages of having separate, but equal, facilities would include: (1) Envisioning difficulty in a proper program of source control for Tijuana. The San Diego System would be isolated from possible contamination or upset by toxic materials. (2) The operation and maintenance cost for Tijuana could be more easily assessed. (3) The treatment facility operation could be tailored to the individual characteristics of the waste flows and thus operate more efficiently. (4) Tijuana envisions significant, immediate wastewater reclamation of an effluent which has undergone only primary treatment. The split system insures Tijuana of a return water of the same character as its effluent. (5) The ocean outfall would be used jointly by Tijuana and San Diego. (6) Well-trained and qualified personnel would be available for operation of the plant. (7) The provision for treating Tijuana effluent would eliminate the current possible source of contamination of the nearshore Pacific Ocean waters.

System D. Figure V-13 shows the location and sizing of facilities for System D which includes a 100 mgd biological secondary treatment facility constructed at Point Loma, an 85 to 90 mgd biological secondary treatment facility at a central San Diego site, and a 10 to 15 mgd biological secondary treatment facility in the Sorrento Valley. An additional ocean outfall would be constructed to serve the Sorrento Valley site as well as a 70 mgd biological secondary treatment facility and ocean outfall to serve Tijuana. The wastewater reclamation programs would be examined as under the other systems.

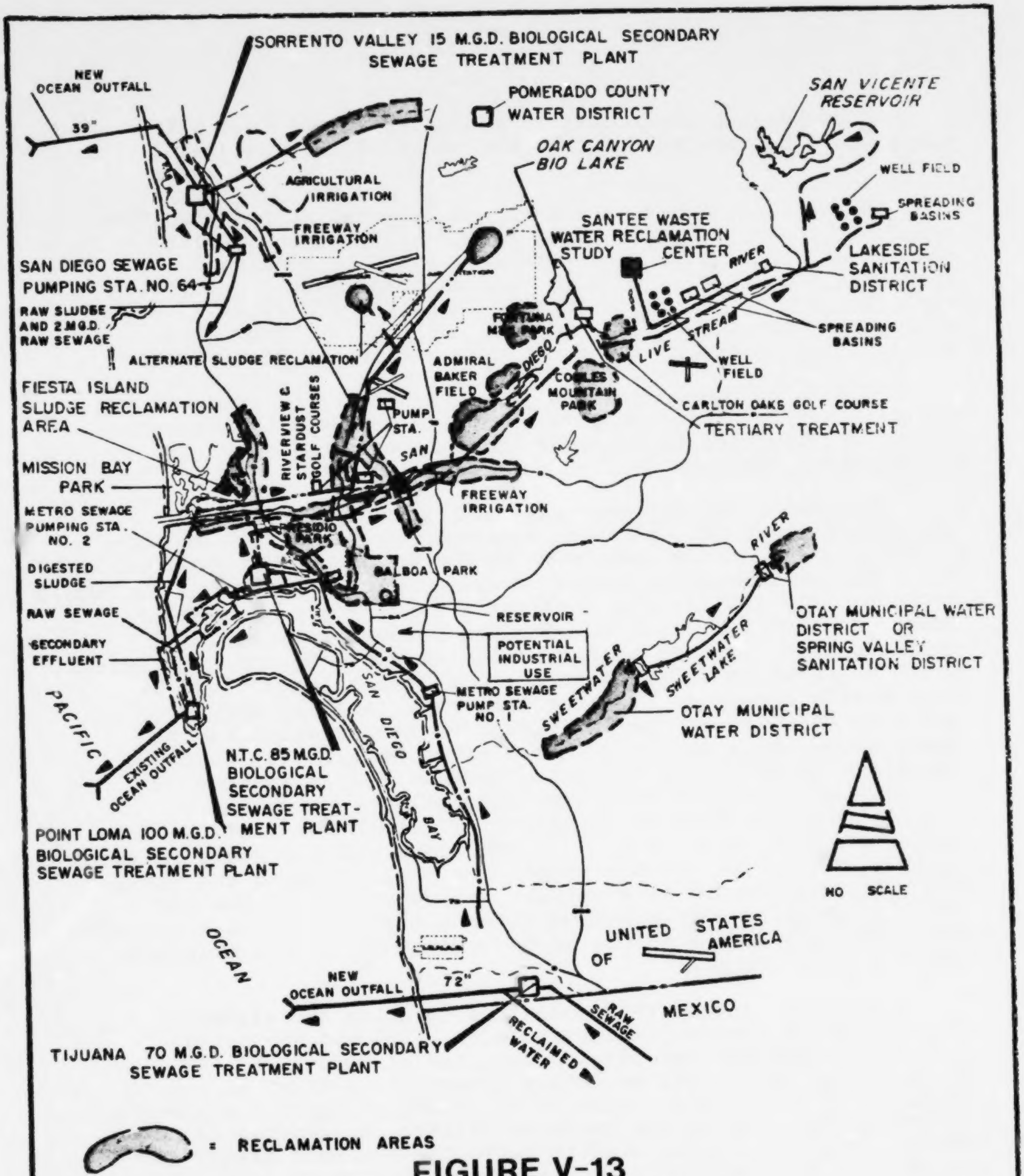

SORRENTO VALLEY 15 M.G.D. BIOLOGICAL SECONDARY SEWAGE TREATMENT PLANT
NEW OCEAN OUTFALL
39"
POMERADO COUNTY WATER DISTRICT
SAN VICENTE RESERVOIR
OAK CANYON BIO LAKE
AGRICULTURAL IRRIGATION
WELL FIELD
SPREADING BASINS
FREEWAY IRRIGATION
SANTEE WASTE WATER RECLAMATION STUDY CENTER
RIVER
LAKESIDE SANITATION DISTRICT
SAN DIEGO SEWAGE PUMPING STA. NO. 64
RAW SLUDGE AND 2 M.G.D. RAW SEWAGE
FORTUNA MTN PARK
LIVE STREAM
SPREADING BASINS
ALTERNATE SLUDGE RECLAMATION
ADMIRAL BAKER FIELD
DIEGO
COWLES MOUNTAIN PARK
WELL FIELD
FIESTA ISLAND SLUDGE RECLAMATION AREA
RIVERVIEW & STARDUST GOLF COURSES
PUMP STA.
CARLTON OAKS GOLF COURSE
TERTIARY TREATMENT
SAN
MISSION BAY PARK
FREEWAY IRRIGATION
METRO SEWAGE PUMPING STA. NO. 2
PRESIDIO PARK
DIGESTED SLUDGE
BALBOA PARK
RIVER
RESERVOIR
RAW SEWAGE
POTENTIAL INDUSTRIAL USE
OTAY MUNICIPAL WATER DISTRICT OR SPRING VALLEY SANITATION DISTRICT
SECONDARY EFFLUENT
SWEETWATER LAKE
SWEETWATER
METRO SEWAGE PUMP STA. NO. 1
PACIFIC
OTAY MUNICIPAL WATER DISTRICT
SAN DIEGO BAY
EXISTING OCEAN OUTFALL
N.T.C. 85 M.G.D. BIOLOGICAL SECONDARY SEWAGE TREATMENT PLANT
POINT LOMA 100 M.G.D. BIOLOGICAL SECONDARY SEWAGE TREATMENT PLANT
NO SCALE
OCEAN
UNITED STATES OF AMERICA
NEW OCEAN OUTFALL
72"
MEXICO
RAW SEWAGE
RECLAIMED WATER
TIJUANA 70 M.G.D. BIOLOGICAL SECONDARY SEWAGE TREATMENT PLANT
= RECLAMATION AREAS

FIGURE V-13
ALTERNATIVE SYSTEM D
LOCATION OF FACILITIES

Source: Lowry & Associates, 1976.

Because of the additional costs and environmental impacts of constructing two additional ocean outfalls and the extensive earthwork required at Point Loma, this system was dropped from further consideration.

System E. Figure V-14 illustrates the location and sizing of facilities. A 150 mgd biological secondary facility would be constructed on vacant property adjacent to Pump Station No. 2, on the Naval Training Center grounds. The effluent would be pumped to Point Loma for subsequent disposal via the ocean outfall. A future expansion would add 50 mgd to the facility. An additional treatment facility and ocean outfall would be constructed in the Tia Juana River Valley to provide service for Tijuana.

The present method of sludge disposal involving anaerobic digestion at Point Loma with subsequent open air drying and use as a soil amendment would continue at Fiesta Island as long as possible. Provision would be made for the construction of a sludge force main from Point Loma to a 250-acre site at Miramar Naval Air Station. Future wastewater reclamation activities are included in this system.

After completion of the Facilities Plan, the California State Water Resources Control Board requested Lowry & Associates to further consider the question of locating treatment facilities in the South Bay area. The report (presented as an Addendum to the Facilities Plan) prepared to fulfill this request included three new alternative systems (numbered 35, 36 and 37) and reassessment of many of the alternatives (both old and new) with a modified screening and ranking system.

Alternative (System) 35. *Alternative 35-1*. Alternative (System) 35 (Figure V-15) provides for phased conversion to biological secondary treatment. Under Phase I, the metropolitan system would be split with half of the flow to the South Bay area for biological treatment and disposal. The remaining one-half of the raw sewage flow would continue to Point Loma for primary treatment and discharge. Primary treatment would continue for approximately ten years.

For Phase I, split system flows arriving at the existing Metropolitan Pumping Station No. 1 would be transported south to the Tia Juana River Valley. This diversion would require the construction of some 65,100 feet of force main and gravity sewer as well as three raw sewage lift stations. Subsequent diversion of flow to the Pump Station No. 1 would require construction of additional interceptors.

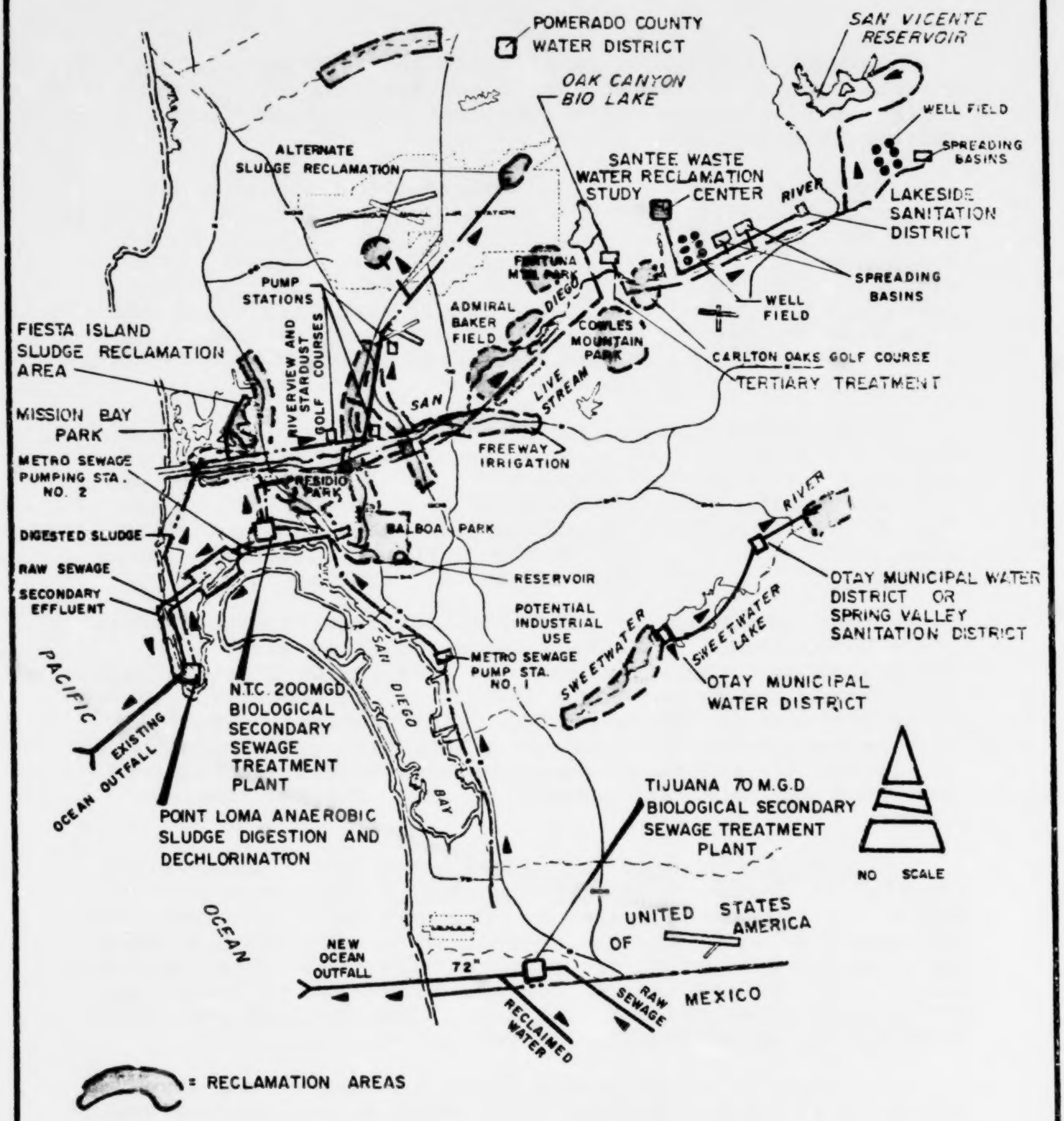


FIGURE V-14

ALTERNATIVE SYSTEM E

LOCATION OF FACILITIES

Source: Lowry & Associates, 1976.

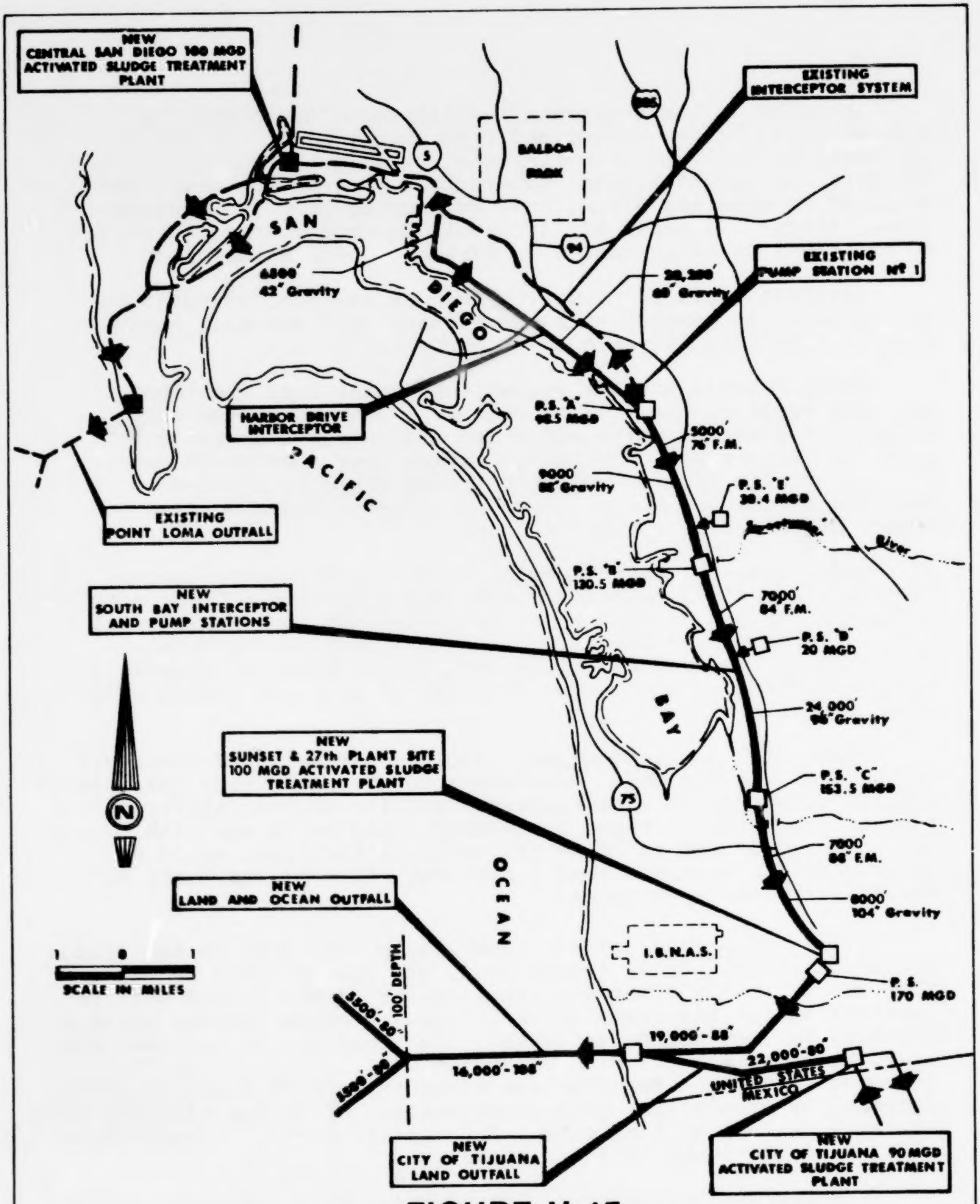


FIGURE V-15
ALTERNATIVE NO. 35

LOCATION OF FACILITIES

Source: Lowry & Associates, 1976.

Location of the treatment facilities in the South Bay area would be on the Sunset and 27th Avenue site. Sludge at the facility would be digested anaerobically, with the digester gas used for in-plant power generation. The sludge would then be piped to open air drying beds for drying prior to reclamation. Sixty-five acres of land would be required under Phase I operations to be increased to 90 acres under Phase II.

Effluent would be pumped through an 88-inch, 19,000-foot land outfall to connect with the Tijuana land outfall, thence, to a 16,000-foot, 108-inch ocean outfall.

Under Phase I of this system, the Point Loma treatment facility would continue to operate as a primary system with additional digester units added and improvements in the grit handling facilities. The sludge drying operation would continue at Fiesta Island. Plastic lining would be applied to sections of the San Diego interceptor system which are currently experiencing corrosion problems.

Under Phase II construction, a 100 mgd biological secondary facility would be constructed at a central San Diego site, either NTC or the Convair Plant No. 2 parking lot (Loma Portal site). Anaerobic sludge digestion would continue at Point Loma with sludge disposal either at Fiesta Island or Miramar Naval Air Station, where some 90 acres of open air drying beds would be utilized.

Phase II construction would include expansion of the South Bay facility to 100 mgd. Provisions for Tijuana under this plan are the construction of a separate facility on the California side of the border. Phase I capacity would be 40 mgd with expansion to 90 mgd in Phase II. Site of the plant would be Dairy Mart and Monument Road. Effluent would be available on demand for reuse by Tijuana.

Alternative 35-2 differs from System 35-1 only in the sludge handling aspect. Under System 35-2, the sludge would be piped from the South Bay treatment facility for direct liquid soil injections in the Tia Juana River Valley. Storage lagoons would be provided for wet weather storage. The remainder of the features would be identical to those of System 35-1. Alternative 35-3 featured sludge incineration and Alternative 35-4 featured sludge disposal by pyrolysis. Both these methods of sludge disposal were rejected because of high energy and capital costs. Alternatives 36-3, 36-4, 37-3 and 37-4 are similar.

Alternative (System) 36. *Alternative 36-1, Phases I and II*. An illustration of this system can be found in Figure V-16. Under this alternative, Phase I would be identical to that in Alternative (System) 35, Phase I. The three differences between Alternatives

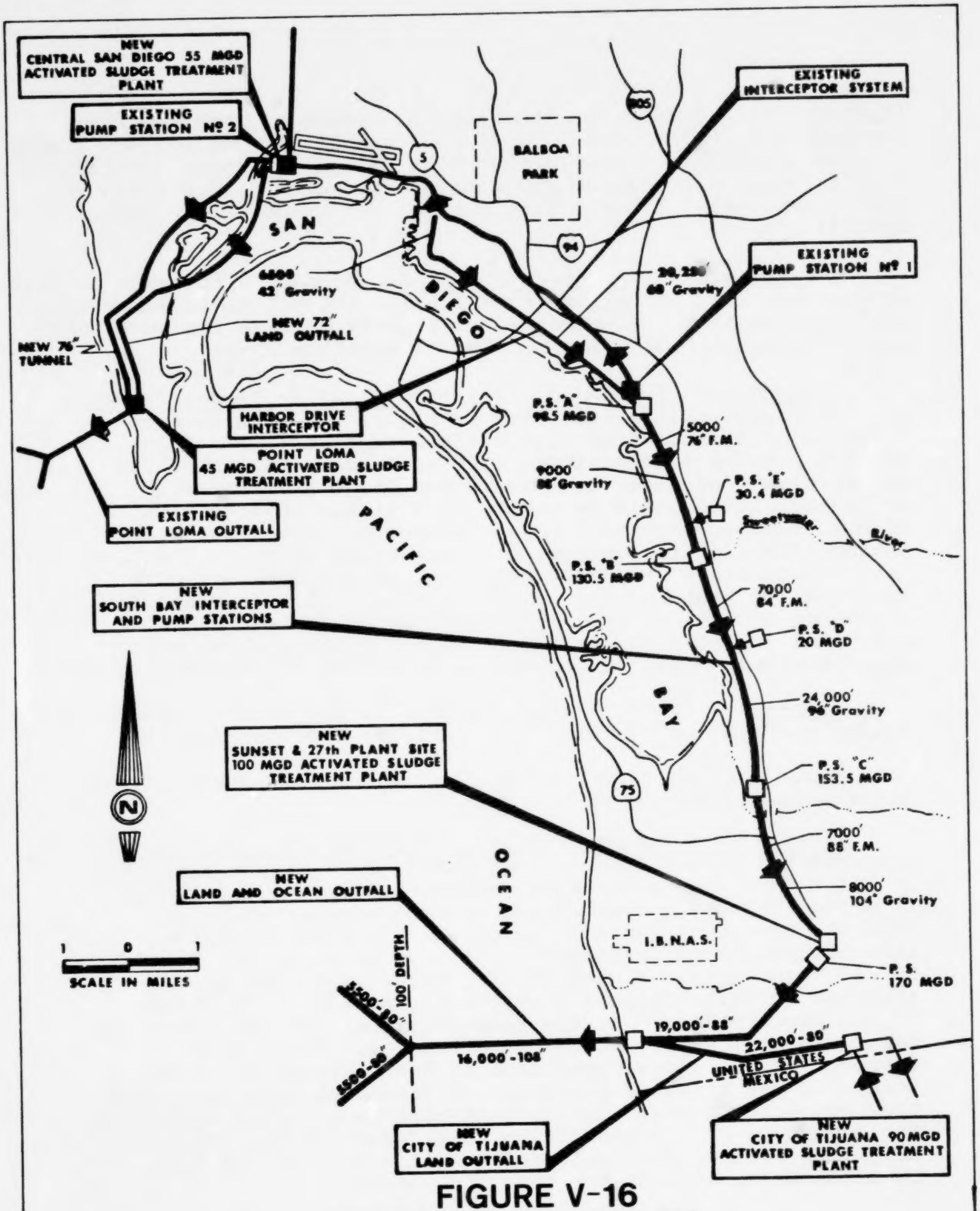


FIGURE V-16
ALTERNATIVE NO. 36
LOCATION OF FACILITIES

Source: Lowry & Associates, 1977.

(Systems) 35 and 36 occur in Phase II. These differences are: conversion of Point Loma to a 45 mgd capacity biological secondary treatment facility; construction of a 55 mgd treatment facility at a central San Diego site; and construction of a land outfall to convey secondary effluent from central San Diego to the ocean outfall.

Alternative 36-2, Phases I and II. The only difference between Alternative 36-1 and Alternative 36-2 is the manner in which the sludge is handled. Alternative 36-2 would utilize the same technique (injection) as described for Alternative 35-2.

Alternative (System) 37. *Alternative 37-1, Phases I and II.* This system is illustrated on Figure V-17. Alternative (System) 37 differs from Alternatives (Systems) 35 and 36 in that a joint treatment facility would be established for the treatment of waste from south San Diego and Tijuana. Joint facilities would be constructed at the intersection of Hollister and Monument Road. Extension of the South Bay Metropolitan Interceptor would be necessary to reach the proposed plant site. Sludge processing and disposal would be identical to that for Alternative (System) 35. In Phase II a 100 mgd biological secondary facility would be located at the Naval Training Center and a 190 mgd biological secondary joint facility would be located at Hollister and Monument Roads.

Alternative 37-2, Phases I and II is the same variation as sludge handling as described for Alternatives 35-2 and 36-2.

Table V-16 is a summary of plant siting and location for Alternatives (Systems) 35, 36 and 37.

Alternatives for Accommodating Tijuana, Baja California. The expected sewage flows from Tijuana, Mexico were presented in Table V-7. The alternative systems all would treat the flow from Tijuana. Some of the systems would require a separate treatment facility which would not be desirable from economic considerations. Systems A, B, D, E, 35 and 36 all require that a completely separate facility be constructed to solve Tijuana's wastewater problem. In System 37 the facilities are at the same location, but the flows are kept separate, except for ocean discharge. While this approach may be undesirable from an overall economic viewpoint, it may simplify planning and financing programs. The flow projections regarding Tijuana must be examined carefully. The lifestyle of the population in Tijuana differs considerably from that of San Diego and the flow projections must be adjusted to account for the differences.

Because of the location of the pump station which serves Tijuana, it is necessary that provision be made to either treat the Tijuana flow or continue to provide the emergency connection as is presently practiced. Reference to Table

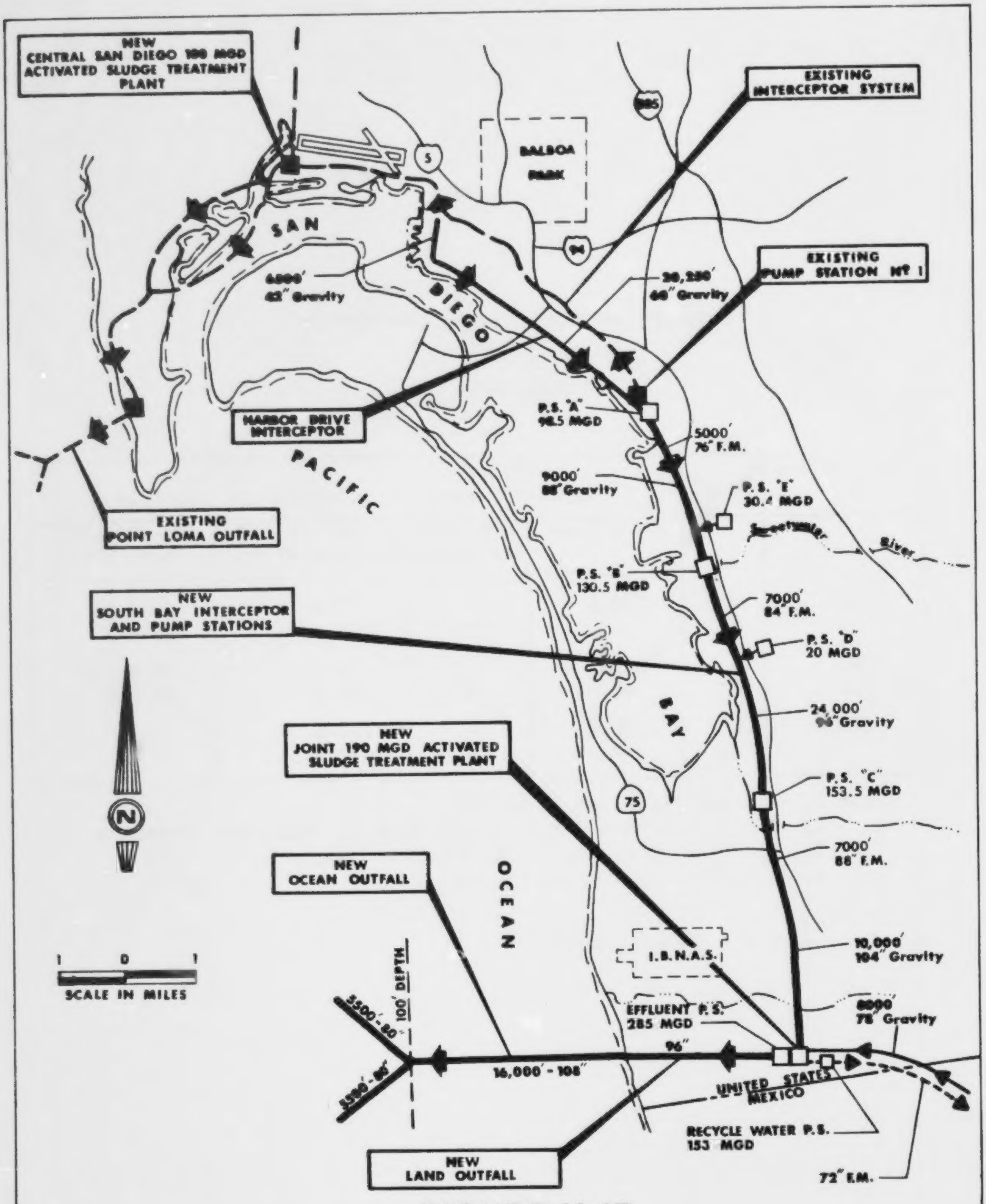


FIGURE V-17
ALTERNATIVE NO. 37
LOCATION OF FACILITIES

Source: Lowry & Associates, 1977.

Summary of South Bay Alternatives

Table V-16

Alternative No.	Phase	Treatment Facility Location and Capacity			
		Point Loma	Central San Diego	Hollister Ave. & Monument Rd.	Foot of Dairy Mart Road
35	I	120 P	-	70 S	40 S T
	II	-	100 S	100 S	90 S T
36	I	120 P	-	70 S	40 S T
	II	45 S	55 S	100 S	90 S T
37	I	120 P	-	110 S Jt.	-
	II	-	100 S	190 S Jt.	-

Notes:
1. All quantities shown in MGD.
2. P = Primary Treatment; S = Biological Secondary Treatment
3. T = Plant Exclusively for Tijuana, Mexico
4. Jt = Joint Plant with Tijuana, Mexico

Source: Lowry & Associates, 1977

View of the proposed 27th and Sunset site looking North. I-5 is to the right in this picture.

SOUTH BAY SITE ALTERNATIVES

Hollister and Monument area.

V-8 will indicate that this emergency connection has been used extensively in the past and with increased flows from the Tijuana area, it is expected that this frequency of use may increase. Should no provision be made for this emergency situation, then the possibility of contamination of the Tia Juana River appears likely.

Because the flow is increasing in Tijuana and this is discharged to an area which may influence the coastal waters off San Diego, it was considered desirable to provide treatment for the waste discharge rather than providing only the emergency connection. Because of the expected increased use of this connection, it might require oversizing of some of the San Diego facilities to handle the emergency flows. The undesirable aspects of mixing the San Diego and Tijuana flows have been discussed in a prior section.

Alternative Facilities Systems Recommended in the Facilities Plan and the EIR

The Facilities Plan contains three recommended systems for the San Diego area ranked in order of desirability. The systems and ranking resulted from a consideration of factors listed as evaluation criteria at the end of this chapter. In the Facilities Plan a matrix was prepared evaluating the various criteria by a weighting system. The criteria covered were cost, engineering, social, environmental, institutional, and energy factors, and compliance with PL 92-500.

As the result of the California State Water Resources Control Board request to the City of San Diego to reconsider the South Bay Alternatives, the matrix and weighting system were revised. Greater weight was given to energy demands, governmental regulatory requirements (NPDES time limits, PL 92-500, secondary treatment requirements) annual costs and Tijuana discharge problem. The recommendations originally given in the Facilities Plan were modified and an additional recommendation (#4) was added. These (Addendum) recommendations are given in Table 17. In the EIR, the Addendum "Recommendations" were called "Choices", but were the same systems and were offered in the same order.

In August, 1977, the San Diego City Council reviewed the recommendations and approved the concept offered in Recommendation No. 4 - a split system with 100 MGD to be processed in central San Diego and 100 MGD to be processed in the South Bay area by the year 2000. Wastewater flows from Tijuana would be treated on the United States side of the border for return of reclaimed water to Mexico or for discharge through the joint land and ocean outfall in the South Bay area.

Table V-17

RECOMMENDED RANKING OF SYSTEMS FROM THE FACILITIES PLAN ADDENDUM

Recommendation	System	Principal Features and Phases*	
1	System A		Continue primary treatment at Pt. Loma with capacity increases to 200 mgd by year 2000
		Phase I -	increase capacity to 150 mgd
		Phase II -	increase capacity to 200 mgd
2	System A/B	Phase I -	Continue 120 mgd primary treatment at Pt. Loma Construct a 30 mgd biological secondary plant at a central location
		Phase II -	(1987) convert Pt. Loma to a 45 mgd biological secondary plant Add 125 mgd capacity to central plant
3	System B or E	System B Phase I -	45 mgd biological secondary plant at Pt. Loma, 105 mgd biological secondary plant at Naval Training Center (or other central city location)
		Phase II -	(1987) Additional 50 mgd biological secondary added to Naval Training Center (or other central city location)
		System E Phase I -	150 mgd biological secondary plant at Naval Training Center (or other central city location)
		Phase II -	Additional 50 mgd biological secondary plant at Naval Training Center (or other central city location)
4	Alternatives (System) 36/37	Phase I -	Construct 70 mgd biological secondary facility in the South Bay area and ocean outfall; supply 40 mgd facility for Tijuana Pt. Loma - continue primary treatment
		Phase II -	Conversion of Pt. Loma to 45 mgd biological secondary; construction of a 55 mgd biological secondary plant in central San Diego Additional 30 mgd expansion of South Bay plant Capacity for Tijuana increase to 90 mgd

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*All Alternatives have the same features for sludge reclamation, industrial waste control, wastewater reclamation, back-up/reclamation facilities for Tijuana

Sludge reclamation - Reclamation of digested sludge at Fiesta Island (use of Miramar only if Fiesta Island not available). Recommendation 4 includes sludge reclamation near the South Bay facility.

Industrial waste control - Source control programs of EPA and State Water Resources Control Board (except attempts to reduce total chromium concentration to 0.005 mg/l)

Wastewater Reclamation - study/research.

Alternatives considered in the EIS impact analyses include:

	Alternative
Biological secondary treatment	7, 8, 9, 10, 11, 14
Sludge treatment	17, 18
Disinfection	22, 23, 24
Tijuana	25, 26, 28, 29
No project	34
Sites	Point Loma, Naval Training Center, Loma Portal, Midway, Naval Station, Palm City, Imperial Beach Naval Air Station, Sunset and 27th Streets, Dairy Mart Road, Hollister Avenue and Monument Road, Sorrento Valley
Systems	B, C, E (see Table V- for component alternatives)
Phased Systems (Introduced in the Addendum)	Alternatives (Systems) 35, 36, 37

Alternative Facilities and Systems Considered for Evaluation in the EIS

Many, many alternative processes and sites have been reviewed and evaluated through several iterations in the development of the Facilities Plan, Addendum and EIR. Public input was involved in the screening of some of the alternative treatment plant sites. In the several years between the development and consideration of the alternatives and the preparation of this EIS, a number of changes have taken place. Some of the proposed sites are no longer available and governmental policies have changed. In an attempt to fairly evaluate the viable alternatives, this EIS will consider more than just the systems and alternatives recommended in the Facilities Plan, Addendum and EIR. No attempt will be made, however, to try to evaluate in detail alternatives which are not reasonably viable (and which were discarded early in the screening process) or alternatives which are not planned for implementation in the immediate future (e.g., reclamation/recycling).

Criteria Used in Evaluating Alternatives. The alternative processes, sites, and systems contained in Tables V-11 to V-17 and discussed above have been evaluated and a determination made as to their suitability in the San Diego Metropolitan system. The following criteria were utilized in the screening and ranking process.

Land Requirements. The amount of land required for primary and secondary treatment is indicated in Table V-18. Tertiary treatment would require about 2-1/2 times as much land as standard secondary treatment or about 300 acres for 200 mgd. Land requirements are somewhat flexible, as adjustments can be made to significantly reduce land requirements.

Pollutant Removal. Table V-19 illustrates the relative ease of removal of various pollutants by the three treatment processes. Suspended solids, heavy metals and chlorinated hydrocarbons are the pollutants of most concern to the marine environment. Nitrogen, phosphorus and BOD_5 would be of concern in any discharge to freshwater or lagoon. Floating particulates are of concern in marine discharge; if the wastewater plume should surface, the floatables would be visible as an oily slick or plume. Table V-6 lists existing and projected effluent constituent concentrations and NPDES effluent limitations.

Sludge Production. In any treatment process, pollutants are not eliminated, rather they are converted to carbon dioxide, water and a residue. The amount of this residue, or sludge, varies with the degree and type of treatment. Primary treatment produces about 0.7 tons of sludge per million gallons of wastewater. Secondary treatment produces about 1.4 tons per million gallons and tertiary treatment about 2.8 tons per million gallons. Tertiary sludge can be harder to dispose of than secondary sludge since it might contain quantities of chemical coagulants and thus might be less useful for reclamation purposes. If tertiary treatment involves desalinization, a highly saline brine is produced which must be discharged.

Table V-18

ESTIMATED LAND REQUIREMENTS FOR SCREENING PURPOSES

METHOD OF TREATMENT	LAND REQUIREMENT, ACRES 50 MGD	100 MGD	150 MGD	200 MGD
Primary	8	10	13	15
Chemical Coagulation				
Ferric Chloride and Alum	8	10	13	15
High Lime	10	12	18	18
Secondary Biological				
Diffused Air Activated Sludge, Conventional, Roomy Layout	50	80	100	120
Complete Mix Mechanical Aeration Deep Tank Activated Sludge	25	40	50	60
Pure Oxygen	25	40	50	60
Packed Tower Trickling Filter	25	40	50	60
Secondary Physical-Chemical	15	20	25	30

Source: El Wardani, 1977.

Table V-19

APPROXIMATE REMOVAL EFFICIENCIES (PERCENT) FOR TREATMENT ALTERNATIVES

Pollutant	Point Loma (1974-75)*	Primary	Primary + Polymer	Primary + Inorganic Chemicals	Secondary		Tertiary Treatment
					Biological	Physical Chemical	
BOD_5	30-35	35	50	65	90	95	96
Suspended Solids	50-60	50	80	85	90	98	98
Settleable Solids	90	90	95	95	95	99	100
Oil and Grease	50-60	50	60	90	90	95	95
Floating Particulates		40	65	70	80	99	100
Phosphorus	10	10	10	85	25	90	95
Nitrogen	25	25	25	25	25	15	90
COD	40	40	55	70	90	95	95
Cadmium	20	20	55	75	90	98	98
Total Chromium	25	25	75	80	90	98	98
Copper	20	20	65	80	80	-	-
Lead	35	35	75	80	90	96	96
Mercury	40	40	60	75	80	90	90
Nickel	15	15	30	20	-	-	-
Silver	10	10	55	60	75	95	95
Zinc	30	30	75	80	80	95	95

Notes: * Varies with the number of sedimentation tanks in use.
(1) All metals removals (except physical/chemical) from Los Angeles County Sanitation Districts June, 1974 Report to EPA Task Force on secondary treatment.
(2) Physical/Chemical removals from NERC Cincinnati.
(3) All other removals generalized from several sources.
(4) PCB removal is approximately 80-90 percent.

Source: El Wardani, 1977.

Cost. Costs affect the viability of wastewater treatment alternatives. The costs for the various levels of treatment including operation and maintenance delivery are given below.

REPRESENTATIVE COSTS OF MUNICIPAL
WASTE TREATMENT PROCESSES

	Treatment Cost (cents/1,000 gallons)		
	1 mgd	10 mgd	100 mgd
Primary treatment (includes sludge disposal)	27.4	15.4	8.8
Secondary-activated sludge (includes primary and sludge disposal)	46.6	27.0	16.4
Tertiary treatment			
With desalinization	105.7	68.4	51.4
Without desalinization	60.2	33.0	19.2

Energy Requirements. Primary treatment is basically a gravity run process and requires very little energy once the wastewater is at the plant site. Primary treatment requires about 100 kilowatt hours (Kwh) for each million gallons processed.

Secondary treatment requires additional energy for air production for the secondary processes and for disinfection. Secondary treatment by the activated sludge process requires about 1,000 Kwh per million gallons. Use of trickling filters can reduce energy consumption somewhat to about 600 Kwh per million gallons. Elimination of disinfection would reduce energy requirements another 100 Kwh per million gallons.

Tertiary treatment is a more complicated process requiring more energy. Additional energy is needed for air blowers if nitrogen removal is practiced, while substantial energy requirements are associated with removal of inorganic ions (desalinization). Full tertiary treatment with reverse osmosis to reduce total dissolved salts to 150 ppm requires about 7,000 Kwh per million gallons, while tertiary treatment not including desalinization requires about 2,000 Kwh per million gallons.

The above criteria are principally related to the technical aspects of the treatment process. For evaluation of the aesthetics aspects and compatibility with existing land use, an ad hoc citizens' advisory panel was formed during the facilities planning process to incorporate public input into the nontechnical aspects of the selection and screening process. The recommendations of the ad hoc committee are in the Facilities Plan and reproduced in Appendix C of this document.

The regulatory constraints utilized in the screening process are examined in the legal, institutional, policy section. Any project must satisfy requirements of PL 92-500, constraints contained in the NPDES permit issued to Point Loma outfall and other requirements imposed by appropriate regulatory agencies.

VI. PRIMARY IMPACTS OF THE ALTERNATIVES

The identification and discussion of the environmental, social and ecomomic impacts of the alternative facilities plans are presented in this and the succeeding chapter. Impacts have been separated in primary (or direct affects) -- the immediate result of a project action or secondary (or indirect effects) -- the consequences of direct effects. The time frame of the impact, short- or long-term, has been used to separate most of the construction impacts from those longer-term, direct impacts. Mitigation measures for primary and secondary impacts are presented in a subsequent chapter.

In order to effectively evaluate the long-term impacts of the many alternatives still under consideration in this report, the alternatives will be grouped under the headings "Plant Site Impacts", "Impacts of the Numbered Alternatives", "Sludge Treatment Impacts", "Impacts of Ocean Discharge", "Impacts of Reclamation", impacts of "Treatment Plant Operations" and "Impacts of the No Action Alternatives". Because the alternatives were described for the most part only in conceptual terms, the impact analysis can go no further than to identify the general impacts that may result from the implementation of any system or its individual components.

Construction Impacts Which May Result From Implementing a Facilities Plan Alternative System

Construction impacts are for the most part short term and capable of being effectively mitigated. Short term in this case refers to the period from initiation of the plan to shortly after the end of construction. Some of the alternatives involve phased construction, but the short-term impacts relate mainly to the periods when facilities are being actively constructed, not the intervening periods. Construction impacts that apply to all or a portion of the alternative are listed in Table VI-1. The construction impacts list (Table VI-1) covers both short-term impacts of construction (e.g., noise generation), as well as the long-term results of construction (e.g., loss of agriculture land under facilities).

Most of the impacts listed in Table VI-1 are self-explanatory; a few need further elaboration:

TABLE VI-1

CONSTRUCTION IMPACTS

1. Effect of spoil disposal.
2. Alteration of topography by excavation for pipelines.
3. Changes in natural drainage patterns by construction.
4. Alteration, erosion of soils resulting from excavation, grading, backfill.
5. Surface water degradation.
6. Runoff transport of sediments and debris.
7. Spills of fuel and maintenance chemicals.
8. Direct noise from construction.
9. Disruption of wildlife, vegetation communities, wildlife habitats, erosion by clearing.
10. Increased fire hazard potential from construction activity.
11. Alteration, destruction of archeological resources.
12. Drilling, blasting of rock if unavoidable by siting and location of facilities.
13. Dust and air pollution generated by construction activities.
14. Visual impact of construction equipment and construction site.
15. Increase in emission of aerial pollutants by construction equipment.
16. Creation of attractive nuisance and safety hazards at construction site.
17. Disruption of traffic.
18. Commercial activity disturbance.
19. Residential area disturbance.
20. Energy and materials consumption.
21. Loss of vegetation -- particularly rare and endangered species.
22. Loss of wildlife -- particularly rare and endangered species.
23. Loss of agricultural land.
24. Loss of wildlife habitat.

- Wildlife Disturbance. The activities of construction -- human activity, heavy construction movements (subsurface vibration), noise, etc. -- will disturb resident animals causing them to temporarily move out of the construction area. If the adjacent area into which the animals move is already at its carrying capacity for that species, the population of the species would be reduced. For each species displaced, the adjacent population of that species will be affected. The area of primary concern in this project is the Tia Juana River Valley and estuary which supports a number of rare and endangered wildlife species on a limited area (See EPA's wetlands responsibilities in Chapter IV).

- Surface Water Degradation. Construction of treatment plants or interceptors can affect water quality by the carrying of sediment and debris and construction fuels and chemicals into waterways during periods of runoff. The impact is accentuated if vegetation is cleared from a site and erosion is accelerated.

- Commercial Activity Disturbance. Interceptor-related trenching in roads can temporarily block access to roadside businesses and create noise and dust conditions that may discourage potential customers. Also, construction through croplands can temporarily disrupt normal agricultural operations by blocking access, interrupting irrigation, cultivating or harvesting, and removing land from cultivation.

- Residential Area Disturbance. Construction impacts on residential areas are similar to those on commercial areas. Temporary blockage of access and creation of noise and dust are the major problems.

- Energy Consumed in Project Construction. Construction of facilities will require a variety of energy consuming equipment. Land leveling and grading, transport of construction materials and excavation for pipelines and interceptors will all utilize gas and diesel-powered vehicles. Energy consumed in construction of treatment plants would be similar for different alternatives except for those sites requiring extensive excavation.

- Energy and Materials Committed to Project Construction. In addition to energy consumed by construction equipment, energy and materials are committed to the project in the form of construction materials and the energy used in production of the materials. Renewable or recyclable materials are committed for the life of the project, while most materials are permanently committed.

- Loss of Rare or Endangered Plant Species. Although many of the proposed alternative plan sites are in urbanized areas, several are in open country, particularly those in the South Bay. Site specific information on rare and endangered plants should be investigated in any site specific facility EIR. The most significant site of concern would be the Tia Juana River Valley, especially the estuary and beach near the river mouth. Rare and endangered plant species are likely to be under more threat from urbanization impacts associated with this project than from direct impacts (except for the Tia Juana Estuary and beach).

- Loss of Archeological Resources. The many archeological and historic sites known in the San Diego area and the as-yet undiscovered archeological sites could be threatened by project implementation. Any of the urban or rural sites may contain subsurface artifacts. An investigation was conducted on the 27th and Sunset site and no archeological remains were located. Such a finding was not considered unusual because of the site's location in a river valley that experienced flooding. Site specific surveys need to be conducted for viable sites before any site can be considered not to have a potential for cultural impact.

- Loss of Rare and Endangered Wildlife or Habitat that Supports such Wildlife. Although the loss of wildlife or wildlife habitat is not a consideration for urban alternative facilities, the Tia Juana River Valley and estuary do support rare and endangered wildlife and such a consideration is important in this area. Any loss of habitat would be detrimental to these species (See also EPA's responsibility to protect wetlands habitat discussed in Chapter IV).

Plant Site Impacts

The land requirements for a treatment plant, as discussed in the Facilities Plan, indicate that as much as 120 acres might be required for a biological treatment plant with 200 mgd capacity. Gross area of the existing plant site at Point Loma is only 37 acres. It was, therefore, necessary for Lowry Associates, the facilities plan engineer, to consider additional treatment sites.

There are three conceptual approaches for handling increased capacity and for locating new facilities. First, treatment facilities could be relocated away from the existing site, maintaining only the ocean outfall, pumping plants and interceptors. Second, only part of the treatment facilities could be relocated, leaving part of Point Loma. Third, satellite treatment plants of 2- to 40-mgd capacity could be established in tributary locations throughout the service area.

Theoretically, every parcel of land close to the metropolitan interceptor merits review as a potential treatment plant site. However, the facilities plan engineer found many suitably-sized parcels already occupies or planned for development. They also found that no public agency plans for central San Diego includes accommodations for a major metropolitan sewage treatment facility. Therefore, Lowry & Associates undertook a selection procedure to identify potential sites that would minimize disruptive effects upon existing land use and future community plans.

This section discusses the various treatment plant sites evaluated in the Facilities Plan, as shown in Figures V-7 to V-9. Based on field inspection, information contained in the Facilities Plan and comments by the Ad Hoc Citizens Advisory Committee, we have evaluated those sites which we consider to be the most feasible. Appendix A of the Facilities Plan presents the committee's complete report and Appendix C of this report contains the committee's recommendations. These sites include:

Central Area
Point Loma
Naval Training Center - north of Metro Sewage Pumping Station #2
Loma Portal - between Midway Drive and Pacific Highway
Midway site - adjacent to sports arena
Naval Station site - adjacent to Pump Station #1

South Bay

Palm City
Imperial Beach Naval Air Station
Sunset and 27th Street
Dairy Mart Road
Hollister Avenue and Monument Road

North City

Sorrento Valley sites

Point Loma - Present Treatment Plant Site

Existing Conditions. The existing metropolitan sewage treatment plant site overlooks the Pacific Ocean near the southerly tip of Point Loma. The 37-acre hillside site is bounded on the south by lands of the Cabrillo National Monument and on the north by property of the Naval Electronics Laboratory. Above the treatment plant site on the east is Fort Rosecrans National Cemetery. The ocean forms the westerly plant boundary.

Natural topography of the treatment plant location reflects Point Loma's rugged character. Elevations vary from sea level at the shore to about 350 feet along the east boundary. A precipitous bluff rises 75 to 100 feet above rocky tidepools along the westerly property line. Behind the bluff, a relatively narrow shelf provides north-south passage along the ocean shore. The shelf gives way to Point Loma's steep flank, which juts an additional 250 feet above the ocean.

The original metropolitan system construction included excavating the northerly portion of the plant site to widen the natural shelf to a level area of approximately nine acres. Grit removal facilities, primary sedimentation tanks, sludge digesters, outfall structure, administration building, shops and other facilities were constructed on the enlarged shelf. Subsequently, an additional digester and two additional sedimentation tanks were added. As conceived by planners of the original system, the nine-acre pad is large enough to accommodate a 240 mgd capacity primary sewage treatment plant.

The southerly tip of Point Loma is considered one of the most beautiful spots in the San Diego metropolitan area. Its land is very sparsely developed in contrast to nearby urbanized neighborhoods. Wide expanses of open space characterize the entire periphery of the plant site. The adjoining Cabrillo National Monument is one of the most popular locations in San Diego, attracting several million visitors each year.

Land Use Plans. The site was obtained by the city through a patent from the Bureau of Land Management which restricts the use of the site to sewage treatment purposes only.

Impacts. Two alternative treatment plant configurations have been proposed to expand treatment facilities at Point Loma The first option requires excavation on the southerly portion of the existing site to enlarge its level shelf area. Cutting slopes similar to these employed originally, it is estimated that the additional net level area that could be gained would amount to 11 acres. Including original construction, a total level area of about 20 acres would then be available.

Excavation of the southerly portion of the existing site would result in about one million cubic yards of spoil which would have to be hauled away for utilization or disposal. Spoil from the original construction was hauled to the higher elevations of Cabrillo National Monument, where several small canyons were filled to construct a headquarters and parking area. Responses to recent inquiries, however, indicate that fill sites may no longer be available on Point Loma proper, requiring a longer spoil haul distance on land for creation of fill or barging to sea for disposal.

Excavation and construction on the southerly portion of the existing Point Loma metropolitan sewage treatment plant site would be carried on immediately adjacent to lands of the Cabrillo National Monument. The National Historic Preservation Act of 1966 and Executive Order 11593 require procedures for the protection of historic and cultural properties where a federal and federally-subsidized project is contemplated adjacent to a national historic site. These procedures are set forth in 36CFR 800 *et. seq*. The resulting comments of the agency official and/or the Advisory Council on Historic Preservation could have an important effect on the use of this site.

The second option proposes the acquisition of additional land in the immediate area necessary to locate a biological secondary sewage treatment plant with capacity of 200 mgd. Even if excavated to its utmost limit, as described above, the existing Point Loma metropolitan sewage treatment plant site cannot accommodate more than 120 mgd biological secondary sewage treatment capacity. Comments and descriptions relative to the first option at Point Loma, including procedures for protection of historic properties, would also be applicable to this option.

Presuming that approximately 20 acres of level land would be available on the existing plant site, it is estimated that an additional 15 acres of level land would have to be created contiguous to the present site. Taking probable extent of cut slopes into account, some 30 acres would be involved in the extension, resulting in a total expanded metropolitan plant site area of approximately 67 acres.

Land immediately north of the existing plant site is owned by the United States government under the jurisdiction of the Naval Electronics Laboratory Center. The topography is very similar to that of the undeveloped portion of the existing metropolitan sewage treatment plant site. There are no buildings or other significant surface structures on the land. Approximately 1,700,000 cubic yards of soil would have to be excavated from the Navy land to obtain 15 acres of level treatment plant site.

Together with the one million yards expected to be excavated from the southerly portion of the existing site, a very sizable volume of spoil would be created for utilization or disposal. Problems associated with spoil disposal on Point Loma were pointed out in discussion of the preceding options. Those problems would be more than doubled in scope and cost under this option.

The minimum parcel needed for a northerly expansion of the existing site to accommodate 200 mgd would measure roughly 1,100 feet in a north-south direction and 1,100 feet in an east-west direction. Contacts were made by the facilities planner with San Diego area U. S. Navy authorities to determine the current availability of the property. On April 1, 1975, Rear Admiral F. B. Gilkeson, Commandant of the Eleventh Naval District, wrote:

> The land at the Naval Electronics Laboratory Center immediately north of the present metropolitan sewage treatment plant is not available.......This land cannot be made available for the following reasons:
>
> a. Utilization of the area for expansion of the sewage treatment plant could result in unacceptable increases in man-made electromagnetic energy interference resulting in a degradation of the electronics RDT&E mission capability of the center.
>
> b. Signal generation involving hazardous high power radiation would be restricted in the area adjacent to the sewage treatment plant by the regular and continuous presence of plant personnel.
>
> c. The Navy will be denied semi-developed areas with a high potential for necessary future installations more compatible with maintaining the natural environment than a sewage plant facility.
>
> d. By endorsing sewage plant expansion in a northerly direction, the Navy would be supporting an action opposite to policies of cooperation with the California Coastal Commission for protecting and enhancing the California coastline environment. The "Mormon Coal Mine" and historical site in the proposed expansion area would also be in jeopardy.

The use of Point Loma will have an adverse impact on the Cabrillo National Monument. The level of impact will depend upon the amount of the site which is used. If the plant is retained at its current use, there will be no increase over the current impacts. If the plant is modified and upgraded to a 45 mgd secondary plant using the existing structure, little additional construction would be required and the impacts would be minimal. If the plant is upgraded to a secondary treatment plant and capacity is limited to 95 mgd, there will be a moderate construction impact, several more acres south of the existing site and adjacent to the monument would be excavated, and about twice as many structures would be located on the site. Most of these structures could be visible from the monument. If the site was upgraded and expanded to 200 mgd, the impacts would be at their maximum. In addition to the impacts noted above for the 95-mgd secondary plant, there would be additional excavation and structures on the 20 acres immediately north of the existing plant site.

Construction of a primary or secondary plant will involve the continued commitment of a coastal area for use as a treatment facility and will have a continued and increased adverse impact on the Cabrillo National Monument. Any expansion of facilities on Point Loma would be inconsistent with the Coastal Zone Conservation Plan.

There would undoubtedly be considerable public complaint concerning the scarring of the area due to the excavation process.

Reclamation Opportunities. The Point Loma site is not as compatible with reclamation as some of the other sites under consideration. If the site is utilized as a 200 mgd secondary plant, any reclamation would require pumping flows back to the reclamation area at great cost or construction of satellite facilities. However, if the site is limited to between 45 and 95 mgd of secondary capacity, the remaining flow would be available for reclamation and could be treated at another site. Since virtually no alternative will involve reclamation of more than 100 mgd, a limited secondary facility at Point Loma is considered compatible with reclamation or construction. A 200 mgd primary plant at Point Loma would virtually prevent wastewater reclamation and provide a system that is totally dependent on ocean disposal.

Naval Training Center - Immediately North of Metropolitan Sewage Pumping Station #2

Existing Conditions. The site at Naval Training Center (NTC) is a parcel of land immediately north of Metropolitan Sewage Pumping Station No. 2, which was recently transferred from the Marine Recruit Depot to the Navy. More than 62 acres of level land make up the plot. The land is presently vacant and is being used by Marine Corps and the Navy for athletic activities. No public roads cross this piece of land and it contains no major utilities other than the 96-inch north branch metropolitan interceptor which runs through the center of the parcel in a north-south direction.

The location is bounded on the south by Harbor Drive and Metropolitan Sewage Pumping Station No. 2; on the west by Camp Nimitz, part of NTC; on the north by the Marine Corps Recruit Depot; and on the east by Lindbergh Field's main runway. A new San Diego International Airport terminal building is planned for construction immediately to the east of the proposed sewage treatment plant site. A highly developed public recreation/aesthetic enjoyment area is located a very short distance south of the site at Spanish Landing Park-Harbor Island Marina.

Land Use Plans. Perhaps the greatest disadvantage confronting use of the site is the Navy's current planning for utilization of the land in the near future. Within the next few years, the Navy intends to erect at least five buildings on the southerly one-third of the site for use as schools, training, weapon storage, research and Naval Reserve training activities. A generous amount of open area will be set aside among the buildings for parking and personnel assembly. Because of its proximity to Lindbergh Field, the northerly two-thirds of the site will be developed as an outdoor athletic area for NTC, baseball diamonds, tennis courts, football fields, a track, handball courts and a swimming pool. A gymnasium, administration building and exchange would also be constructed in the northerly two-thirds of the parcel.

Recently, proposals have been made for the conversion of the airport property to a neighborhood of very attractive high-rise residential and office buildings within the next 10 to 20 years.

Aviation elements of the Regional Transportation Plan policies pertaining to commercial aviation state that "CPO shall coordinate the development of a route location plan for improving access to Lindbergh Field".

Impacts. One of the most attractive features of the NTC site is its large, unobstructed size. No improvements would have to be removed or destroyed, no roadways closed, no utilities shifted, no land use disrupted, no vast excavations made. If a substantial fraction of the metropolitan sewage flow were to receive secondary treatment at this site, the need for rehabilitation or replacement of the 114-inch Point Loma interceptor would be averted.

Along with these advantages, this option also has several disadvantages and potential problems. It is located in the old channel of the San Diego River. Until recently, at least a portion of the site was used as a sanitary landfill for nearby naval installations. Therefore, surface and subsurface soil conditions should be considered poor in terms of withstanding heavy loads. The provision of special foundations and possible relocation of buried solid wastes will add to the development costs. Also, construction in the high groundwater which is typical of the area will be troublesome.

Authorities at the Port of San Diego have indicated that this "proposed site for secondary treatment . . . lies in the path of future access or egress from the terminal area to the freeway system north of the field" which are in direct violation of aviation elements of the Regional Transportation Plan policies.*

None of the existing surrounding land uses, including the jet aircraft operation from Lindbergh Field, would cause any conflict with the operation of a sewage treatment plant. However, the existence of such a plant might cause difficulties in the realization of proposed plans for the conversion of the air field into a residential and office complex.

After an inquiry to the Navy concerning availability of the site, in whole or in part, for sewage treatment purposes, Commanding Officer at the Western Division of the Naval Facilities Engineering Command stated that

> "construction of a secondary treatment plant as proposed by Lowry and Associates on the 'unused NTC-MCRD land' is totally unacceptable".

Such construction would eliminate six baseball diamonds, two football fields, the obstacle course, 15 athletic courts, the recruit assembly/drill field, and reduce the size of the half-mile track. Aside from these physical impacts, the training facilities including recruit barracks would create high public exposure to sewage treatment facilities situated there. The full text of the Navy's letters of response are presented in Appendix R of the Metropolitan Facilities Plan.

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*Personal communication from Don Nay, Port Director, Port of San Diego and Lindbergh Field Air Terminal, to City Planning Department, San Diego, March 21, 1977.

Reclamation Opportunities. The NTC site is a good location for implementing a central plant reclamation concept. The site is in very good position to meet the reclamation objectives of central San Diego (Balboa and Mission Park), but less favorable for reclamation in other areas.

Loma Portal - Between Midway Drive and Pacific Highway

Existing Conditions. The Loma Portal site is comprised of a large parcel, most of which is an automobile parking lot used by employees of Air Force Plant No. 19 (Convair Plant No. 2). Because of the very low level of activity in the plant, the parking lot is virtually unused at the present time. It is understood that the plant will be surplus to Air Force needs within a few years, but will continue to be used by the Navy and NASA indefinitely.

The contemplated site itself would extend beyond the boundaries of the above parking lot to take in contiguous commercial properties consisting of a permanent residential trailer park and most of Sports Arena Boulevard south of Rosecrans Boulevard. City streets at the perimeter of the site are Midway Drive on the west, Enterprise Street on the south, Pacific Highway and Kurtz Street on the east. Commercial private property borders the site on the north, with proximity to Rosecrans Street dependent upon final design.

Land use activities surrounding the Loma Portal location are exclusively industrial, commercial and military. San Diego's main post office, facing the site from across Midway Drive, attracts a steady stream of patrons from throughout the city, as do some of the nearby restaurants and shopping facilities. The nearest highly developed residential areas are a military housing village more than 1,000 feet to the west, and the Old Town residential area, a similar distance to the east. Residences in the higher portion of Old Town and at the westerly extremity of Mission Hills look down upon the site.

Land Use Plans. The Midway Community Plan (City of San Diego, 1969), calls for the development of a regional commercial/light industrial/recreational center in the area surrounding the site (see Figure VI-1). Future residential development will be of medium and medium high density in the areas to the south and west of the post office, to the west of Midway Drive, to the north of West Point Loma Boulevard, and to the north of Sports Arena Boulevard.

A parking lot presently occupies a large portion of the site and there are no plans for its removal. The remaining area of the site has been designated for specialized commercial development.

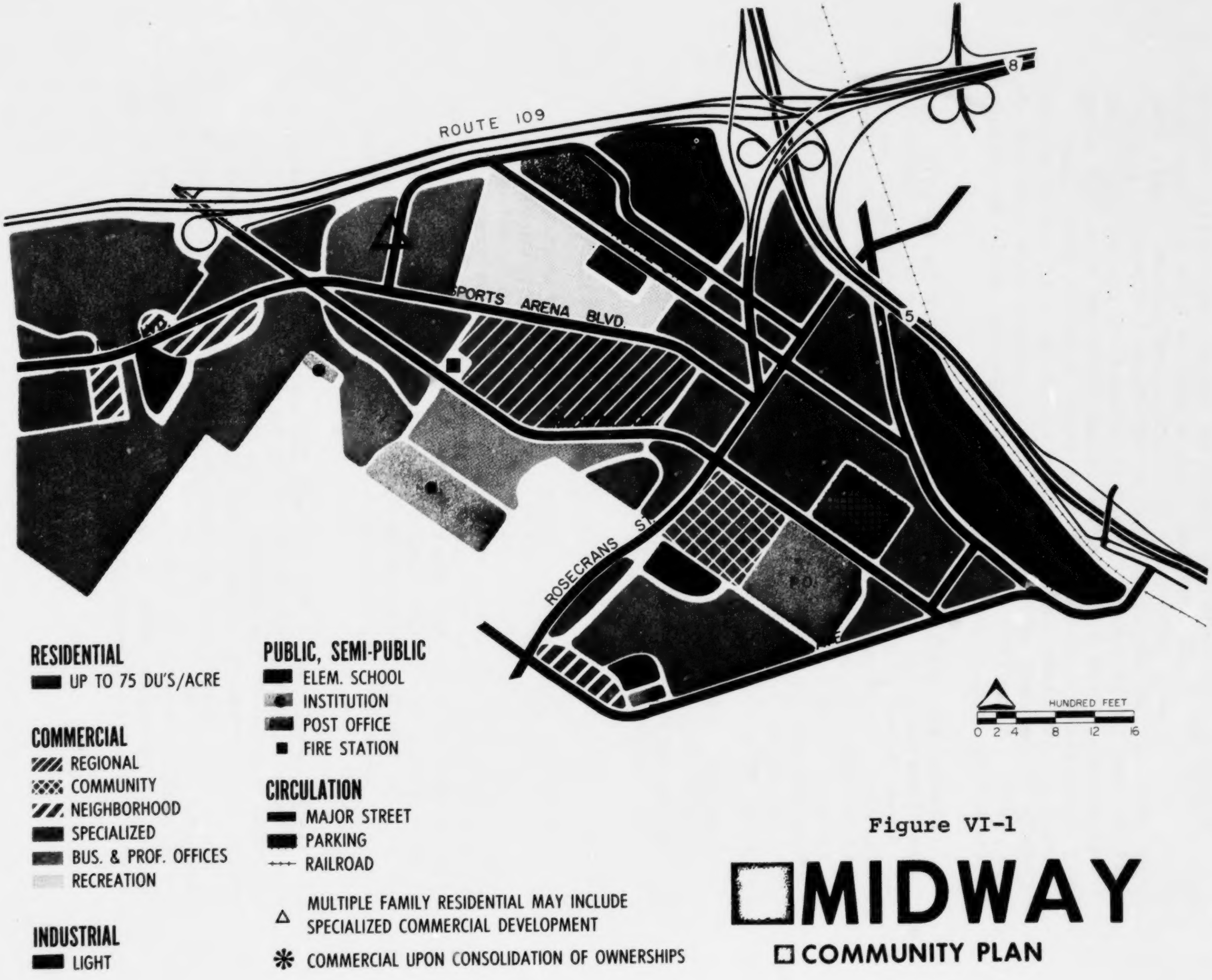


Figure VI-1

MIDWAY

COMMUNITY PLAN

Impacts. At least 41 acres of vacant or easily vacated level land can be integrated into a single site at this location. If it were necessary to acquire additional land, the site could be enlarged by taking additional commercial properties and buildings. The north branch of the metropolitan interceptor system would be diverted into the site for secondary biological treatment of the total flow in that line. Present projections indicate that the line will carry approximately 50 percent of the total metropolitan flow through the year 2000. A facility with 100 mgd capacity would be planned, but the site can accommodate 200 mgd.

Foundation conditions at Loma Portal may be as poor as those described for the Naval Training Center site, since the San Diego River previously meandered through this area also. Similarly, ground water conditions may be equally troublesome. Other disadvantages of this site would be the need to close a portion of Sports Arena Boulevard, to relocate existing residences and businesses and, potentially, to continue using the land as parking facilities for Air Force Plant No. 19 and the post office.

Reclamation Opportunities. Because of its close proximity to Mission Bay Park, Mission Valley and Balboa Park, Loma Portal is well situated to transmit treated effluent by pipeline to these potential points of use.

Midway - Adjacent to Channel Way West of Sports Arena

Existing Conditions. This 25 acres just west of the San Diego Sports Arena parking lot is presently vacant and unused. As a "super satellite" 100 mgd sewage treatment plant site, the location would be only one mile west of the north branch metropolitan interceptor. The sports arena site is bordered on the west by Channel Way, on the north by Interstate 8, on the east by the sports arena parking lot, and on the south by Sports Arena Boulevard: this area of the city is primarily devoted to commercial and industrial activities.

Land Use Plans. The Midway Community Plan designated the area in the immediate vicinity as commercial use of a regional nature and encouraged the development of medium and medium high density residential development nearby (see Figure VI-1). The site under evaluation is presently two vacant parcels. Part of the site has been leased by the city for a motel/hotel-commercial and multiple residential complex. The remaining 10 acres west of Hancock is available for lease and is designated as commercial-office in the plan.

Impacts. The area under consideration is fairly level so a massive earth moving program for site preparation would not be necessary. High ground water and poor subsurface soil conditions could make heavy subsurface construction somewhat more difficult than at other alternative sites.

Due to the commercial-industrial nature of the activities in the area, public contact would occur as people come to the area to work, to visit businesses or industrial establishments, to use the Sports Arena, or passing by in automobiles. Few, if any, nearby residences would be affected by activities at the plant.

The construction of the new pumping station and the force main would require major construction on Rosecrans or Nimitz which would result in substantial disruption in the neighborhood and commercial areas.

Reclamation Opportunities. The sports arena location would be advantageous for wastewater reclamation; delivering reclaimed effluent to Mission Bay Aquatic Park in Mission Valley, in Balboa Park, etc.

Naval Station - Adjacent to Metropolitan Sewage Pumping Station No. 1

Existing Conditions. Approximately 30 acres of vacant Navy land exists in the immediate vicinity of Pumping Station No. 1 and could be used for a 100 mgd treatment plant. San Diego Metropolitan Sewage Pumping Station No. 1 is located in an industrial area of the city at San Diego's border with National City. The station is on South Harbor Drive close to San Diego Bay, but separated from the shore by the San Diego Naval Station.

Land Use Plans. Although much of the Naval Station land east of Harbor Drive is currently vacant, a development program has been in progress for a number of years on the property. One objective of the program is to provide modern buildings for Naval activities formerly housed in temporary and overcrowded quarters dating back to World War II or earlier. New buildings housing schools, barracks, officer quarters, recreational facilities, a commissary and other activities already exist at the north end of the property. Navy land near the pumping station and to the south and east is either vacant or in use for recreation. Joint use of the site by the Navy and the city would have to be negotiated.

Impacts. Treatment capacity of facilities which would be installed on the site under consideration would be somewhere between 50 mgd and 100 mgd. Secondary sewage effluent would be pumped from the site to the Point Loma ocean outfall through a new force main installed for the purpose. Two routes might be used for such a force main: (1) along Harbor Drive to Point Loma, paralleling the existing interceptor system a good deal of the way and (2) across San Diego Bay, through Coronado and North Island, across San Diego Bay a second time near Ballast Point, and then to the outfall.

While the Metropolitan Sewage Pumping Station No. 1 site has definite advantages in terms of surrounding land uses and proximity to the metropolitan interceptor system, its 12-mile distance from the Point Loma outfall must be acknowledged as a major disadvantage. While it has the initial advantage of being level and not requiring major earth-moving programs for site preparation, it could also suffer from poor foundation conditions and high ground water problems.

A parcel as large as 310 acres could be assembled near the southerly end of the property without interfering with any existing uses. However, it is understood that the Navy's development program scheduled construction within the next few years of buildings and other facilities throughout the present vacant portion of the Naval Station, leaving no area available for municipal purposes.

Reclamation Opportunities. There are no known major markets for reclaimed water in the immediate vicinity of the station at the present time. However, reclaimed water might be supplied to points of use reasonably close to the route of the outfall. These additional lines for distribution of effluent would be the only item of construction in residential areas. These lines would be small diameter pipes and the construction impacts would be minimal.

Palm City - Palm City Sanitation District Plant Site

Existing Conditions. The Palm City site is located just south of the Otay River. It is the old Palm City Sanitation District sewage treatment plant site amidst the farm land along Nineteenth Street, between Palm Avenue and the river. The Palm City sewage treatment plant has been abandoned except for its raw sewage lift station, which now pumps San Diego and Imperial Beach sewage into the metropolitan interceptor.

Much of the land in the vicinity of the old Palm City Sanitation District sewage treatment plant is comprised of filled wetlands. On the north, the site is bordered by the Otay River, the right-of-way of the San Diego and Arizona Eastern Railroad, and the Western Salt Company evaporation ponds. Interstate 5 Freeway borders the site on the east. Commercial property and a moderate size mobile home park are located to the south, while residential and commercial land uses exist some distance to the west of the site.

Land Use Plans. The acreage under evaluation for the Palm City site is presently zoned for agricultural use (A-1-1) and no plans for altering this existing use have been proposed (see Figure VI-2 and VI-3).

Impacts. Any metropolitan sewage treatment facility in South Bay would possibly result from splitting the metropolitan system into two or more treatment/discharge centers. Probably not more than 100 mgd of raw sewage would be directed to the South Bay area. If necessary, the needed treatment facilities could be constructed on a site as small as 30 to 60 acres. A parcel of this magnitute could be assembled from the neighboring farm land without having to make any significant amount of improvements. On the other hand, acquisition and construction upon the site would have the undesirable effect of taking 30 to 60 acres of crop land out of service.

Removal of 30 to 60 acres of crop land from production could have the additional undesirable effect of reducing the amount of habitat and feeding area available to wildlife along the Otay River and in south San Diego Bay. However, the nearby Western Salt Company evaporation ponds are intensively used as habitat, resting and breeding sites by aquatic birds.

A sewage treatment operation at the Palm City site would have a fair amount of isolation from the public. However, the site is bordered by development only on the south side. The commercial-residential development could be a source of land use conflicts.

Because much of the land in this vicinity is comprised of filled wetlands, it should be expected that soil conditions in the immediate area would be poor for foundation of heavy structures and that groundwater would be a problem in extensive subsurface construction.

While Palm City is a central location for the southerly portion of the San Diego metropolitan area, it is farther removed from Tijuana than any of the other South Bay sites. It is, therefore, not very likely that Tijuana sewage would be piped as far north as Palm City to engage in a joint operation. As a result, selection of the Palm City option would probably mean provision of separate back-up storage or treatment facilities for Tijuana, although the use of a joint international ocean outfall would not be ruled out in this instance.

Depending upon how the metropolitan interceptor system were split, all raw sewage arriving at Metropolitan Sewage Pumping Station No. 1 could be conveyed southerly to this site. Another alternative would be to split the system farther south, at the junction of the Sweetwater interceptor bringing a smaller volume of sewage to the South Bay site.

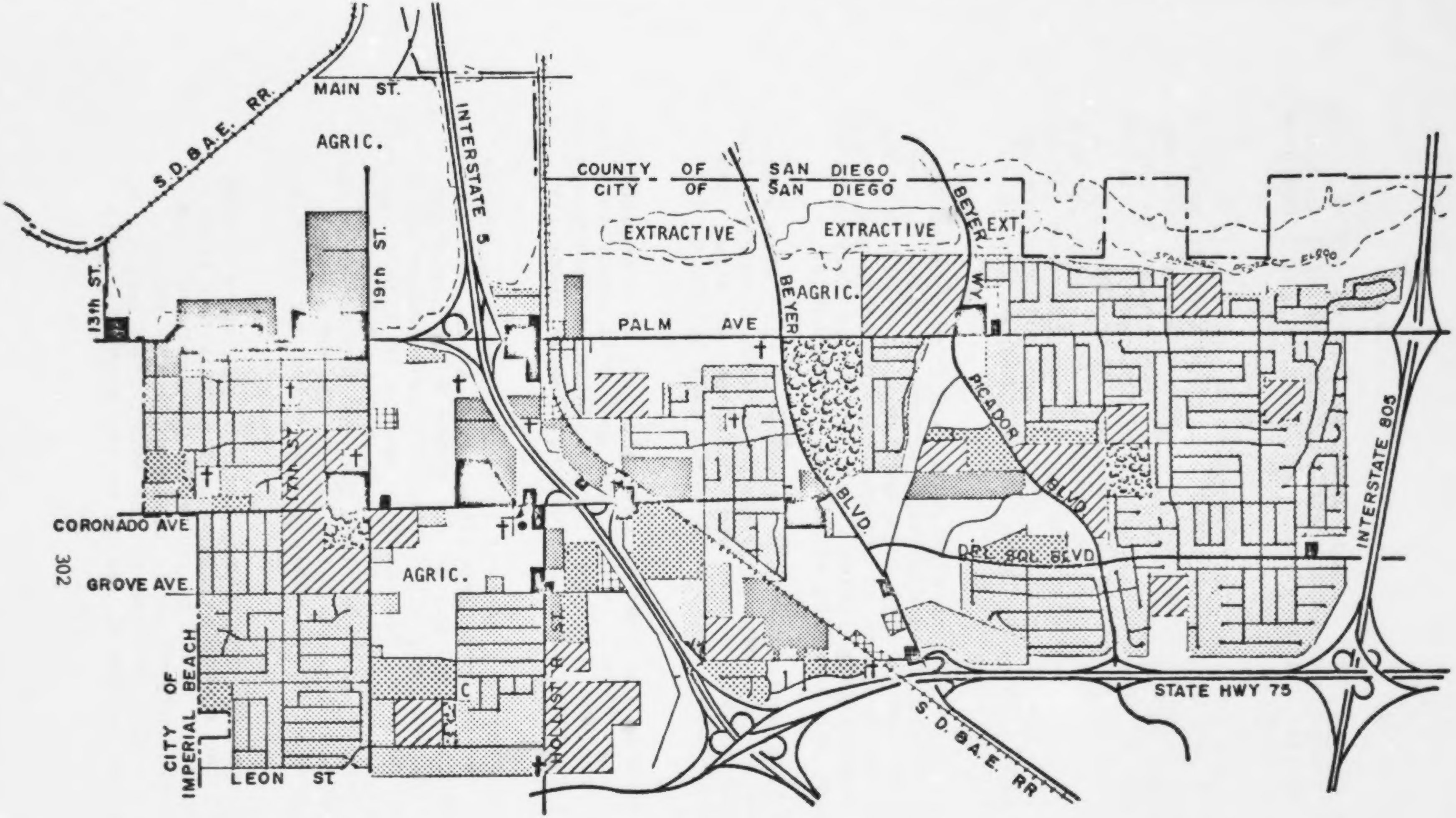
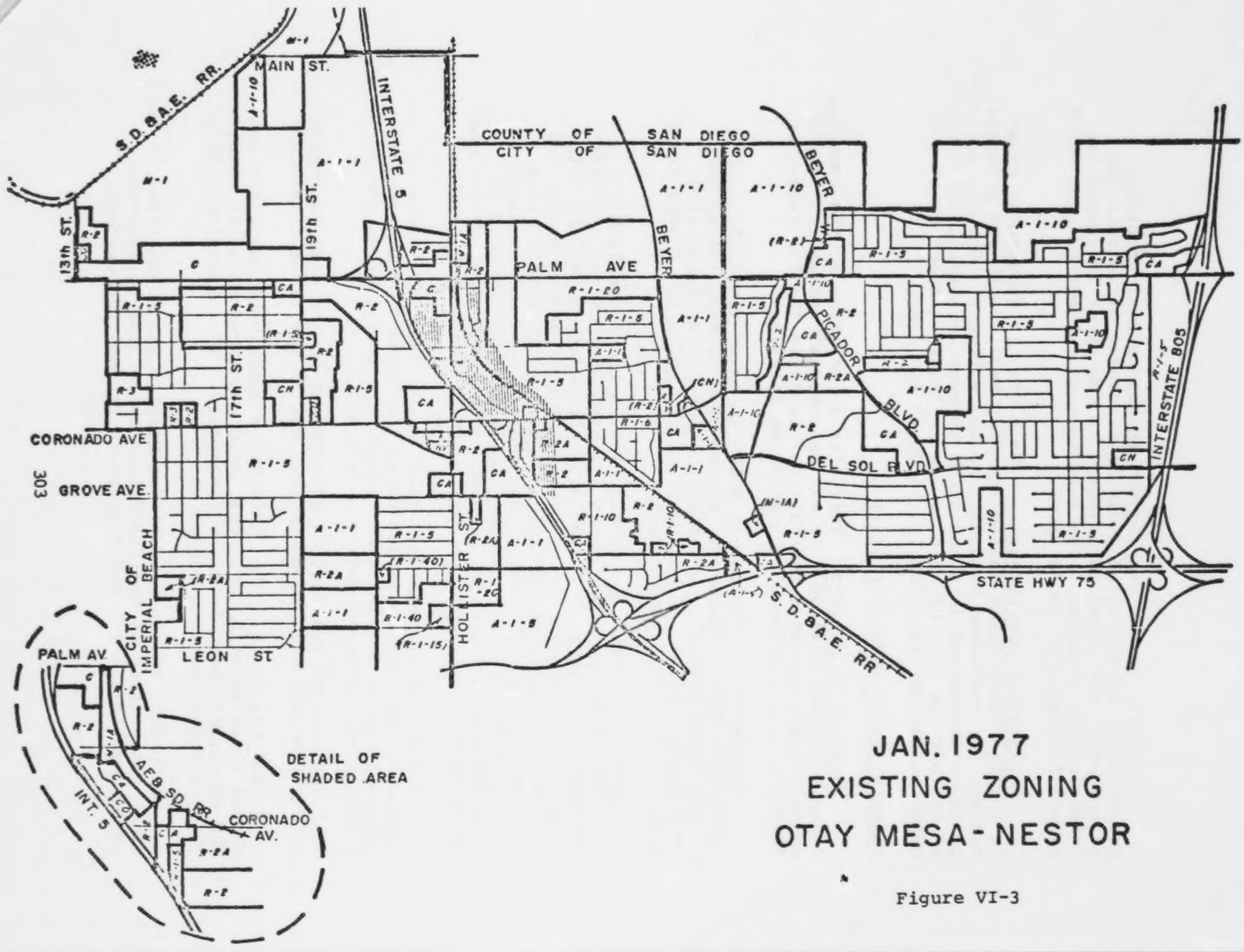


Figure VI-2

EXISTING LAND USE
OTAY MESA-NESTOR

░ SINGLE-FAMILY
▒ MULTI-FAMILY
▓ TRAILER PARK
☐ COMMERCIAL
▦ INDUSTRIAL
▨ SCHOOLS
▩ PARKS
C CEMETARY
† CHURCHES



JAN. 1977
EXISTING ZONING
OTAY MESA-NESTOR

Figure VI-3

Proximity to the Otay River creates several problems. Construction of the plant could have adverse effects on the river, while the location adjacent to the river increases the potential for flooding. The site is also subject to some flood hazard from the Tia Juana River.

Reclamation Opportunities. Palm City is reasonably close to the Tia Juana River Valley and Otay Mesa. Both are potential markets for reclaimed secondary sewage effluent. Surplus effluent could be discharged into the ocean through an outfall which would extend off the foot of Palm Avenue in Imperial Beach or at some other convenient location in the South Bay area.

Imperial Beach Naval Air Station

Existing Conditions. This site is adjacent to the Imperial Beach Naval Air Station. It was selected to permit evaluation of relatively isolated agricultural lands in the Tia Juana River floodplain as a metropolitan facility location.

Currently, approximately 1,100 acres of the 4,450-acre floodplain are irrigated and represent a substantial amount of San Diego County's potentially prime agricultural land. Production consists of a variety of row crops and forage crops used mainly for grazing animals.

The area devoted to farming within the floodplain is being steadily diminished. As a consequence of the drought, the over-exploitation of the local groundwaters and the retention of runoff in the upper basin, the groundwater supply and the soil in the lower floodplain have so deteriorated that farming has been confined to the eastern half of the valley. All but about 200 acres of the floodplain are now held by developers and investment groups. (Tia Juana River Valley Plan and Environmental Impact Report, City of San Diego, 1976).

Aside from agricultural uses in the area, 673 acres of wetlands under the jurisdiction of the State Park and Recreation Department are being maintained and preserved as recreational open space and natural preserve.

The nearest residential development to the site is approximately one-half mile to the north, out of the river floodplain.

Land Use Plans. The State Parks Department has plans to expand their existing holdings, which are predominantly along the coast, eastward into the floodplain. The approximate size of this expansion is 2,600 acres.

According to the City of San Diego's Tia Juana River Valley Plan, the portion of the floodplain which lies between the levee paralleling I-5 and Nineteenth Street, the easterly boundary of the proposed state park has been designated an agricultural preserve. This area contains 1,400 acres presently zoned for agricultural use (see Figure VI-4).

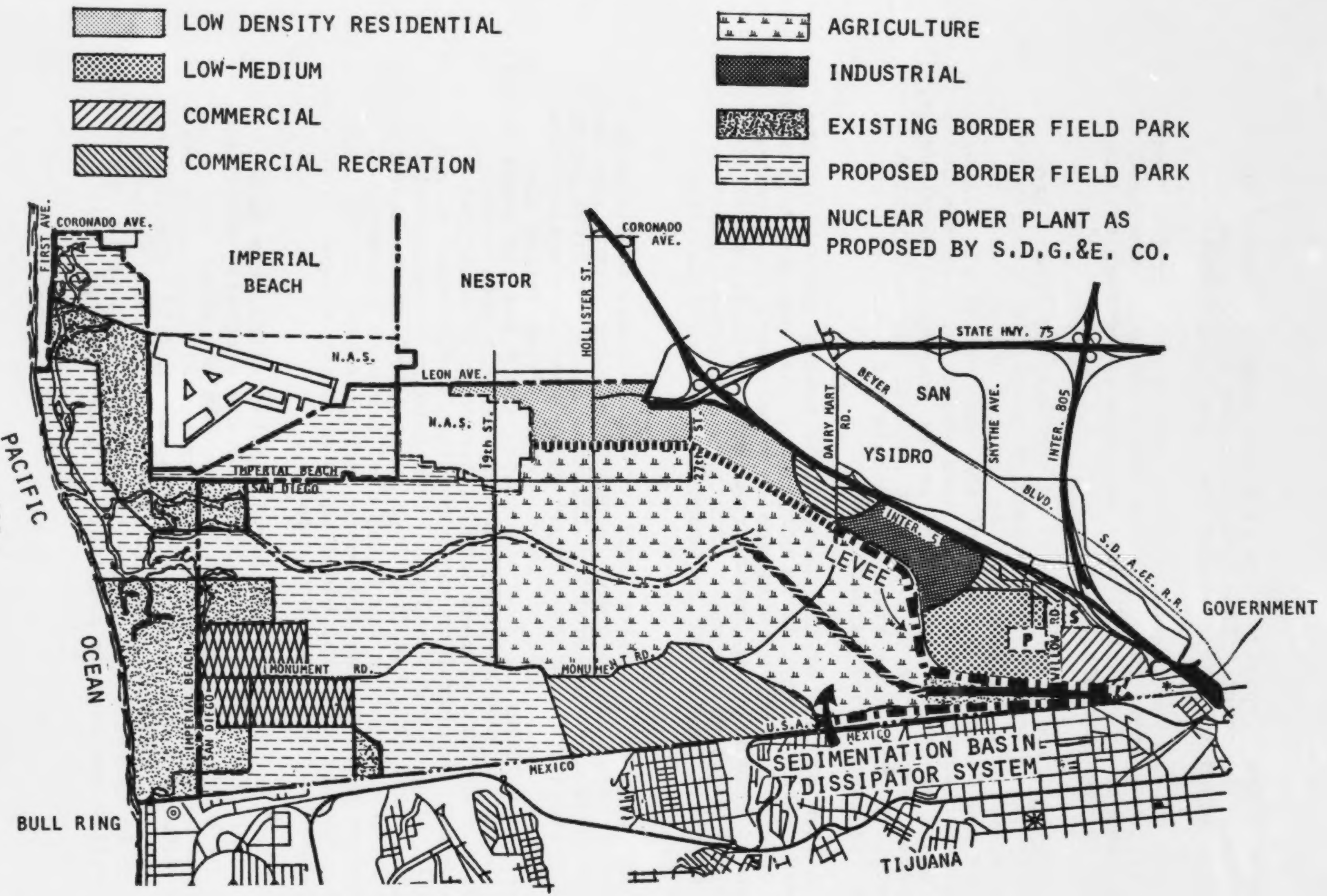
City of San Diego flood control policy for the Tia Juana River Valley states that urbanized areas shall be contained behind levees; only agricultural and open space uses will be allowed in the floodplain.

Impacts. The site, as well as surrounding lands, are literally flat, requiring no extensive excavation program for site preparation. Acreage need be limited only by what is feasible and desirable because of the openness of the valley. Planning for construction in the area would not face the usual constraints of nearby residential and/or commercial development, but instead would have to take into account the Air Station boundary, the Tia Juana River floodplain and wetlands formed by the Tia Juana River Estuary.

In view of City of San Diego flood control policy for the Tia Juana River Valley, it is not likely that any new development would create problems of encroaching development for a metropolitan or international sewage treatment installation at the Ream Field location. However, locating a treatment plant in the floodplain sets a bad precedent in terms of floodplain preservation.

Although well isolated from developed areas, acquisition and use of the lands adjacent to Ream Field for sewage treatment purposes would have several disadvantages. In the first place, a fairly significant acreage would be removed from agricultural use. Agricultural lands of the Tia Juana River Valley also function as habitat and feeding grounds for birds and small animals which currently take advantage of the valley's open space. In addition to loss of open land, a large-scale municipal sewage treatment operation may constitute a deterrent to use of nearby arms of the Tia Juana River Estuary by waterfowl and other wildlife. Finally, some of the land at the westerly end of Sunset Street is now being used for such recreational purposes as ball playing and horse riding; taking of the lands used for these activities would cause at least another minor dislocation of open space enjoyment.

As in the case of the other South Bay sites, the Ream Field location would be considered for the southerly treatment center of a split metropolitan system. In the event that it were decided to abandon the Point Loma outfall completely and locate total metropolitan treatment/ocean outfall capacity in South Bay, a facility large enough to fulfill total treatment needs could be installed on the lands being discussed. Moreover, sufficient area is available to provide for a joint



THIS MAP REPRESENTS LAND USE PROPOSALS BY THE CITY OF SAN DIEGO WITHIN ITS CITY LIMITS. PROPOSALS OUTSIDE THE CITY SOLELY REPRESENT THOSE BY STATE AND FEDERAL AGENCIES.

Figure VI-4

TIA JUANA RIVER VALLEY PLAN

treatment facility with Tijuana, Mexico either as part of a split or reversed San Diego metropolitan system. Point of concentration of the total City of Tijuana raw sewage flow lies less than two and one-half miles southeast of the Ream Field site.

Reclamation Opportunities. Location of properties in the valley adjacent to the Air Station is particularly well suited for reclamation of effluent by agricultural irrigation and groundwater recharge in the Tia Juana River Valley by pumping to Otay Mesa for agricultural irrigation and by pumping upstream in the Tia Juana River for use in the planned Mexican wastewater reclamation project.

Sunset Avenue and Twenty-seventh Street at Interstate 5 Freeway

Existing Conditions. The Sunset Street site is at the north edge of the Tia Juana River Valley. The site is roughly triangular in shape, with 27th Street forming the westerly boundary, Sunset Avenue extended forming the southerly boundary and Interstate 5 Freeway making up the third side in a northwest-southeast direction. Roughly 80 acres of now vacant land would be available.

Until recently, the general area of the Sunset Street site could be described as rural-agricultural. Residences were scattered and generally mixed with agricultural activities, such as dairy farming and row crop farming. The nearest homes were located to the east of the candidate site across Interstate 5 Freeway at a distance of about 500 feet. Since January of 1976 and the writing of the Facilities Plan, the development of a residential subdivision has begun on a large parcel of land immediately west of the proposed plant site, extending from 27th Street to Hollister Street. The proposed site, however, is still available for the development of a treatment plant.

The main channel of the Tia Juana River passes about one-quarter mile south of the site. In its nearby reach immediately above and below Dairy Mart Road, the river channel is confined within a long series of borrow pits which effectively confine low and moderate flows entering from Mexico.

A portion of the site apparently has recently been filled to bring its land surface elevation above anticipated flood flow levels in the Tia Juana River. Because of its elevation, the location is not in the designated 100-year floodplain.

Land Use Plans. The Tia Juana River Valley Plan designated the area bounded by Leon Avenue and Interstate 5 to the north and east, the Naval Air Station on the west, and the levee to the south for low density residential development (see Figure VI-4).

Impacts. Residential development surrounding the site has already begun and there seems little doubt that the area will continue to grow as a southerly extension of the Nestor area of San Diego.

A treatment plant in this area can be accommodated by altering the plans for a facility on the Sunset Street site. Only the facilities which constitute the processing units of a 100-mgd plant to sewer the San Diego metropolitan system would be located on the 27th Street and Sunset Avenue plant. Acreage for open-air sludge drying beds and joint treatment facilities for San Diego and the City of Tijuana would be located approximately one mile from this site.

Soils at the Sunset Street site should provide satisfactory foundation for heavy structures, while ground water would not be anticipated as a major problem during construction. Very little earthwork would have to be accomplished other than that involved in excavating for the structures and possible construction of a flood protection berm.

Reclamation Opportunities. The Sunset Street site is very conveniently situated for distribution of reclaimed effluent throughout the Tia Juana River Valley for agricultural irrigation purposes, for discharge to spreading basins for recharge of the Tia Juana River groundwater basin and for the ultimate establishment of a "live-stream" in the Tia Juana River, provided that a technically acceptable program can be worked out. In addition, the location is close enough to Otay Mesa to encourage serious consideration of pumping secondary effluent to Otay Mesa for agricultural irrigation or other reclamation practices. As an international project, a facility located on the Sunset Avenue site would be close enough to Mexico to seriously consider pumping treated effluent back to Mexico for some 12-miles use in the planned Mexican wastewater reclamation area. Based on soil type analysis, Lowry and Associates, 1976, (Part 6) identified 2,300 acres in the Tia Juana River Valley and 6,100 acres in Otay Mesa South of potential agricultural acreage that could be irrigated with reclaimed effluent. At a further distance they identified 1,300 acres in the Otay River Valley and 8,700 acres on Otay Mesa North.

Dairy Mart Road

Existing Conditions. The Dairy Mart Road site is located at the intersection of Monument and Dairy Mart Road in the floodplain of the Tia Juana River. The land under consideration is level and presently in use for general agricultural purposes. The site is approximately one and one-half miles from the terminus of the Tia Juana River flood control channel in Tijuana and one and one-fourth miles from the main chain of the Tia Juana River.

Land Use Plans. The Tia Juana River Valley Plan of the City of San Diego proposes that the site and surrounding area continue to be used for agricultural purposes (see Figure VI-4).

Existing plans (completion scheduled for October, 1978) for flood control facilities place this general site northwest of the intersection of Monument and Dairy Mart Roads within the levees and in the sedimentation basin. A realignment of Dairy Mart Road to the west in this area is planned.

Impacts. The development of this site as a treatment plant would not interfere with the activities of any existing surrounding uses.

The site, however, is in the Tia Juana floodplain and is within the levees and sedimentation basin downstream from the dissipator structure.

Reclamation Opportunities. Effluent output of the plant could be piped to Mexico for conveyance to reclaimed water use areas. The Dairy Mart Road site is conveniently situated for distribution of reclaimed effluent throughout the Tia Juana River Valley for agricultural irrigation, for discharge to spreading basins for recharge of the Tia Juana River groundwater basin and for the ultimate establishment of a "live-stream" in the Tia Juana River (provided that a technically acceptable program can be worked out). The location is close enough to Otay Mesa to encourage serious consideration of pumping secondary effluent to Otay Mesa for agricultural irrigation or other reclamation practices. Acreage figures given in the description for the Sunset and 27th site are applicable for this site also.

Hollister Avenue and Monument Road

Existing Conditions. This site is located at the intersection of Hollister Avenue and Monument Road on the south edge of the Tia Juana River Valley at the foot of Spooners Mesa. The parcel and its surrounding lands are in the floodplain and are now in use for production of crops or as pasture land. The site is one-half mile from the main channel of the Tia Juana River.

Land Use Plans. Because of the floodplain designation, open space use of this land is likely to continue for many years to come. In addition, the Tia Juana River Valley Plan of the City of San Diego (see Figure VI-4) designates the site and its immediately surrounding lands as agricultural land, park use of land west of 19th Street and commercial recreation use on Spooners Mesa immediately south of the plant site. This site is downstream of the flood control facilities discussed above.

Impacts. All of the activities mentioned above (except perhaps flood control would appear to be compatible with the operation of a major metropolitan sewage treatment plant. Open-air sludge drying beds for the "joint" plant would cover approximately 145 acres extending westerly from the plant site proper. A portion of the beds will be constructed west of 19th Street, in the area contemplated for annexation to Border Field State Park. The facilities plan engineer (Lowry & Associates, 1976, 1977) noted that the drying beds would not interfere with use of the park in any way and should be considered a compatible land use. The dewatering of the sludge through the use of centrifuges could significantly diminish the acreage requirements.

Reclamation Opportunities. This site is well located for disposal of reclaimed water onto surrounding agricultural lands. Effluent could be piped across the Mexican border for use as irrigation water. The potential sites and acreages listed above in the Sunset and 27th site are also applicable to this nearby site.

Sorrento Valley - Near Intersection of Interstate 5 and Interstate 108

Existing Conditions. San Diego's north city area is presently served by the Penasquitos sewage system which also serves the City of Del Mar and the Pomerado County Water District. Raw sewage from the Penasquitos system is pumped south over the divide between Sorrento Valley and Rose Canyon to flow via community interceptors and the metropolitan interceptor to Point Loma for treatment and ocean disposal. Although the 303-foot liftout of Sorrento Valley is unusually high for a raw sewage pumping operation, no troubles have been encountered with the Penasquitos system since its inception in 1970.

Focal point of sewage flows in the system is City of San Diego Pumping Station No. 64, located in Sorrento Valley at the intersection of Roselle Street and Begonia Street. Until very recently, this section of the City of San Diego was rather isolated, characterized by small agricultural operations and a few scattered homes. In recent years, the Interstate 5 Freeway has been constructed through the valley and a large planned industrial/scientific park has replaced pasture lands and cultivated patches. Growth of the industrial park is continuing. No new residential units have been constructed in the valley. Most of the few original houses have been converted to offices or other commercial use.

Sorrento Valley is in the north coastal area of the City of San Diego, lying between Torrey Pines Mesa and the City of Del Mar. Relatively small and narrow, the valley does not rise much above sea level in elevation. At its coastal extremity is Penasquitos Lagoon, a tidal marsh and a State of California wildlife preserve. High mesas and rolling hills rise abruptly from the valley floor on virtually all sides, creating an air of confinement.

Penasquitos Creek passes through the valley from southeast to northwest, draining lands as far east as Poway Valley, Carrol Canyon Creek, Carmel Valley Creek and Penasquitos Creek in Sorrento Valley. Lands tributary to the valley are still in open space categories of use, such as grazing and dry farming. However, intensive residential development began about the periphery of the area approximately 20 years ago in Poway.

Land Use Plans. Development plans for this area involve expanding the existing industrial park in the directions indicated in Figure VI-5.

Impacts. To provide for possible analysis of an alternative calling for separation of the Penasquitos system from the San Diego metropolitan system, evaluation of potential sewage treatment/wastewater reclamation plant sites was made in the Sorrento Valley area. Acreage requirements were projected upon an anticipated 15-mgd raw sewage flow from the Penasquitos system in the year 2000; a biological secondary treatment system would be installed, with tertiary components as necessary. Sludges would not be processed on the site, but would be pumped through the existing connection to the metropolitan system for disposal/reclamation. It was determined that a site covering between five and ten acres in Sorrento Valley would be needed.

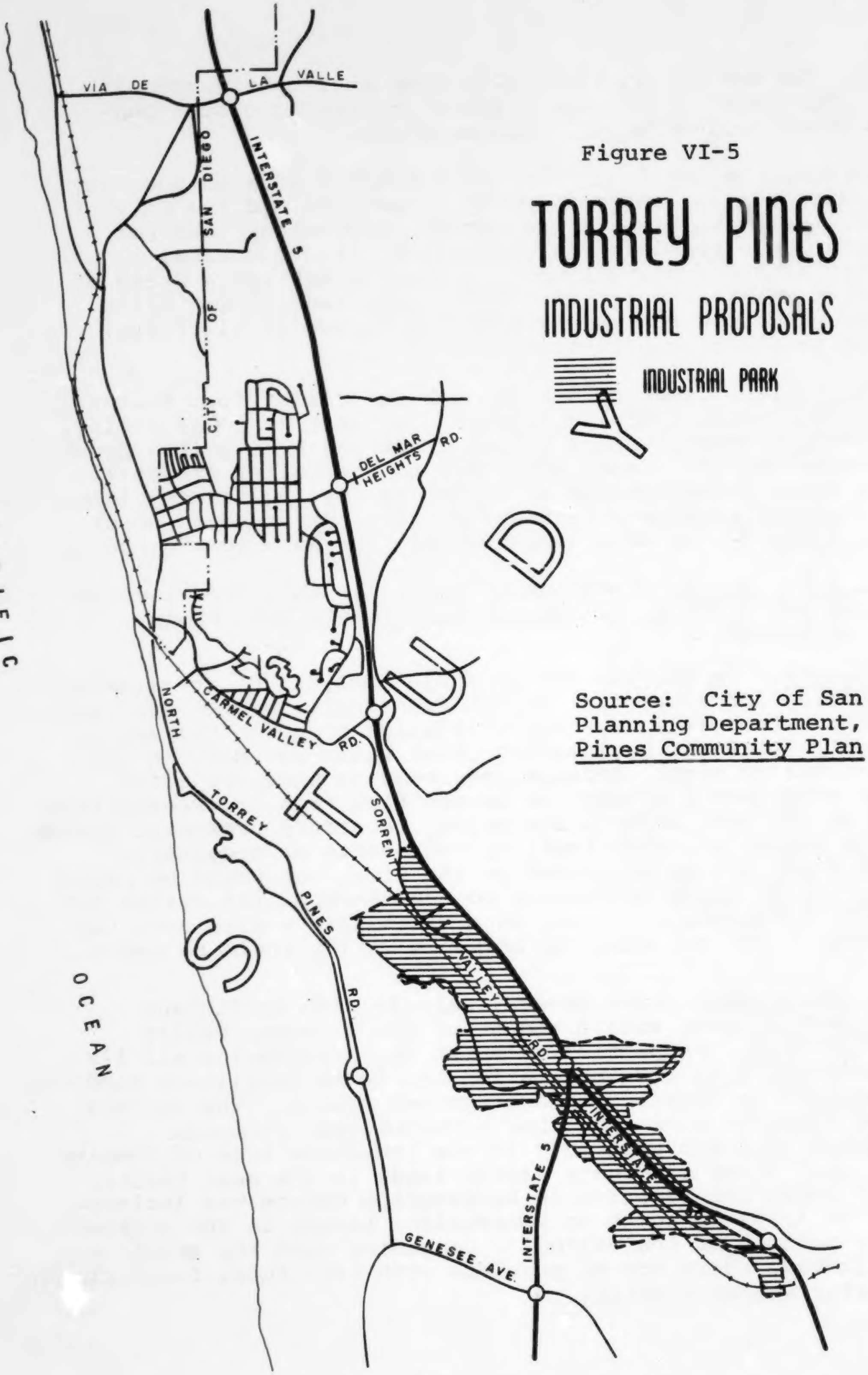
At the present time, several parcels with sufficient acreage may be found within and about the Sorrento Valley Industrial Park. Properties selected for examination all lie relatively close to Pumping Station No. 64 to facilitate handling of sewage and to simplify sludge removal piping. The parcels examined range in size from five acres to over 40 acres. Development of industrial lots in the immediate area of Pumping Station No. 64 may eliminate vacant lands in the near future. Thus, at least one location in Pensaquitos Canyon was included, as well as lands adjacent to Penasquitos Lagoon in the northwesterly portion of the valley. Depending upon the specific site selected, there may be problems with structural foundations, groundwater and/or flooding.

Figure VI-5

TORREY PINES

INDUSTRIAL PROPOSALS

▨ INDUSTRIAL PARK



Source: City of San Diego Planning Department, Torrey Pines Community Plan (1974)

Reclamation Opportunities. Sites in Sorrento Valley are convenient to potential areas of wastewater reclamation at Penasquitos Ranch, Torrey Pines (1,388 acres), and possibly San Dieguito Valley (1,000 potential agricultural irrigation acres) (Lowry and Associates, 1976).

Sludge Treatment Impacts

Sludge is presently dewatered by air drying at Fiesta Island and reclaimed for use as a soil amendment. The dried sludge is mixed with sand, kelp particles and other materials and is used for landscaping San Diego parks. The dried sludge currently being treated in this way averages about 75 tons per day, requires about 40 acres on Fiesta Island, and costs about $29 per ton. The master plan for the land and water use in Mission Bay has three options under consideration -- retain sludge operations permanently as a source of topsoil; retain the operations temporarily; or terminate the operations and provide for recreational use of the site. No option has been selected, but two alternate locales have received consideration -- Miramar Naval Air Station and the Tia Juana River Valley.

Treatment of the sludge from 200 mgd of secondary effluent by air drying and reclamation would require about 150 acres of land. Operations could continue at Fiesta Island at little increase in cost. Miramar is a feasible alternative because the areas under consideration are in the flight path and will probably remain isolated for some time. Utilization of this site would require construction of about 40,000 feet of force main. The longer pipeline would result in higher conveyance costs, raising the cost of reclaimed sludge to about $76 per ton. The longer line also increases the chances of breaks and leaks. The area is recognized by the California Natural Areas Coordinating Council for its vernal pools and mounds and for the rare and endangered plant species it supports. As urban development destroys other vernal pools in the San Diego area, Miramar may become one of the few protected vernal pool areas remaining. Sludge dewatering would be incompatible with continued growth of the rare and endangered species. Locations of the vernal pools and rare and endangered species need to be carefully delineated before any specific sites at Miramar are considered.

Sludge could be air dried and reclaimed in the Tia Juana River Valley. If a central treatment concept is chosen, about 68,000 feet of pipeline would be required, raising reclamation costs to approximately $86 per ton. If a southern treatment alternative was selected, sludge reclamation would be much cheaper, about $63 per ton and require up to 200 acres of land (acreage depends on phasing and inclusion of Tijuana).

Leachate from sludge drying could be a potential problem at either the Miramar or Tia Juana Valley site if underdrains were not provided. Drainage could be returned to the metropolitan system for treatment. Lands used for sludge dewatering and reclamation activities would be lost to agricultural production. The proposed sludge drying sites in the Tia Juana River Valley are all within the floodplain and could be subject to flooding. If flooding occurred sludge could be carried into the Tia Juana Estuary and out to sea. Sites would be protected from 100-year frequency floods by berms.

Tia Juana River possible sludge drying bed sites include: 1) for the 27th and Sunset treatment plant site, the beds would be located along the north side of Sunset Avenue, beginning at a point approximately 1,100 feet west of Hollister Street and extending past 19th Street to the Imperial Beach Naval Air Station Boundary. 2) in the Hollister and Monument treatment plant site, the beds would lie directly adjacent and west of the plant. Both the sludge bed sites and the treatment plant sites are not considered precise in the Facilities Plan Addendum.

Continued operation of Fiesta Island as a sludge dewatering and reclamation site is likely for some time. Potential impacts at this site relate to nuisance odor and public health concerns. The increased sludge production from both the increase in treatment capacity and the change to secondary treatment (greater sludge production) may yield an odor problem where none exists in present operation. Public health concerns over heavy metals, toxicants and pathogenic organisms in sludge used as a soil amendment and later exposed to human contact are recently gaining some attention. These concerns have yet to be translated into policy changes or new standards. New regulations, at least in draft form, are expected by the end of 1977. If public health concerns are not justified or can be mitigated, use of sludge as a soil amendment has far greater beneficial uses than landfilling or ocean disposal and is far less energy intensive than pyrolysis or incineration.

If the sludge were applied in the Tia Juana River Valley to agricultural lands, a number of potential impacts need to be considered. At the reclamation site, 3,400 acres would be required for disposal. Storage would also be required for rainy seasons. Sludge filtrate contains 3,332 mg/l TDS, 525 mg/l chlorides, and 8.74 mg/l heavy metals, so direct application of sludge could have adverse impacts on groundwater quality and soil productivity. Salinity is currently a problem in the groundwater, and land application would add additional salt. Chlorides can interfere with the permeability of some soils, hindering the long-term productivity of the soils at the disposal site. Heavy metals can adversely affect soil productivity and can also become a potential public health concern. Heavy metals accumulate near the surface of the ground. These metals can then be taken up and concentrated by crops. If the crops grown are food crops, the metals can enter the food chain and become a public health concern. Nonfood crops such as fiber crops, or seed crops like safflower and some fodder crops can be grown without problem. However, steady application of sludge containing heavy metals for a period of ten to twenty years can render agricultural soil unfit for food crops of any sort. Care must be taken to manage such land to prevent future problems. Sludge application can have direct health effects if applied to areas where food crops are grown, even if applied at such low rates that heavy metals are not of concern. Sludge contains virus and pathogens as well as cysts which can transmit disease, none of which are destroyed by sludge digestion. If non-processed food crops are grown on land to which sludge has been applied, these organisms can transmit disease directly to man. Direct sludge application must be used with care. This method would be most feasible if a treatment plant in the Tia Juana Valley were chosen. Application rates should be very conservative to prevent excessive metal buildup in the soils.

An alternative sludge handling concept proposed in the Facilities Plan Addendum (1977) involves pumping of untreated sludge to the Tia Juana River Valley for direct liquid injection (alternatives 35-2, 36-2, and 37-2). Principal advantages to this procedure would be the elimination of the sludge digestion units and costs associated with the construction and operation of this facility. However, the operation of anaerobic digesters do produce usable methane gas which can be utilized for in plant power and the gas would not be available without digestion.

For the Phase I operation of any of the South Bay Alternatives some 900 acres of land would be required for use under this process. For Phase II, approximately 1,800 acres of land would be required.

Principal impacts of this method sludge disposal would include the loss of the digester gas, possible interaction of liquid sludge and the soil mass, public health problems due to untreated sludge, possible increase in soil salinity, odor and nuisance problems associated with decaying organic material and loss of valuable land for production of food products for human consumption. The heavy metal buildup and possible virus problems would be a definite problem with this method of disposal.

Reclamation Impacts

Although reclamation is discussed at some length in the Facilities Plan and in the EIR, little specific work has been undertaken. Reclamation of part of the wastewater flow at a central plant and/or satellite plants has been discussed. Reclamation of water in San Diego faces several major problems. The mineral quality of San Diego sewage ranges from marginal to unacceptable for reclamation without desalinization. The composite sewage reaching the Point Loma treatment plant has an average salinity of about 2,000 mg/l with a range of 1,300 to 7,000 mg/l. One thousand one hundred mg/l TDS is regarded as the upper practical limit for use of reclaimed water with minimum hazard if plant damage or intolerant interference with domestic use. Salt enters the sewage from two principal sources in addition to that already in the water -- infiltration of salt water into the sewage collector pipes and home water softener regeneration brines. If wastewater is to be reclaimed, controls must be implemented for these sources.

The location of the treatment plant(s) is important in any reclamation projects because of the requirements of close proximity to the reuse sites. Satellite plants have the advantage of being closer to reuse possibilities and probably having better quality water. They, however, have the cost effectiveness problem of small size, which means higher unit costs. A number of schemes are being considered by the city and their engineers. In the site impact section, compatibility with reclamation options were considered. Additional reclamation options considered included groundwater recharge, but only in an area of sea water intrusion, because of the effluent's high salinity; a "line-stream" discharge, unfortunately in the same area where discharge has been stopped because of mosquito and other public health problems; direct recycling to potable water supplies, which has no acceptance by public health agencies; and agricultural irrigation, which would require additional treatment of the effluent to be acceptable for crop use.

It can be concluded, therefore, that there are a number of factors deterring the reclamation of wastewater on a substantial scale in the San Diego area at this time. First, there are unresolved public health concerns about direct and indirect human consumption of wastewater. These concerns prevent direct consumption of wastewater and discourage reclamation methods which might increase indirect consumption. Second, there are problems in San Diego with the mineral quality of the effluent. These problems must be resolved, or desalinization must be practiced, to increase the marketability of the effluent. The quality of the effluent will be improved by the provision of State Project Water (see earlier discussion on "Water Supply") in the near future (providing rainfall returns to normal). Third, the current cost of agricultural water supplies in California is not a natural cost, rather, the cost is subsidized by domestic water users. It is virtually impossible for reclaimed water to compete with this artificially low price. Since agriculture consumes over 85 percent of the water used in California, this subsidized price is a major encouragement to water-intensive agriculture and a major constraint to wastewater reclamation. Fourth, the health problems preventing direct reuse of wastewater by humans necessitate a separate delivery system for reclaimed water. This puts reclaimed water at an even greater disadvantage in competing with subsidized agricultural supplies. Finally, the satellite systems which could provide reclaimed water at least cost, have substantial drawbacks. Since wastewater demand fluctuates during the year, a satellite system must either provide for storage for the effluent, treat the effluent to a high enough degree for direct stream discharge, or provide backup capacity in the downstream system. Until these problems are resolved, or until the cost of power helps overcome the price disadvantages of reclaimed water, large-scale reclamation is unlikely.

The cost of high quality reclaimed water was estimated (Lowry and Associates, 1976, Part 6) to be approximately $350/million gallons at the plant (distribution costs not included. Direct use of nondisinfected secondary effluent for golf course or crop irrigation (distribution costs not included) could be as little as $160/million gallons (considering savings for not discharging to the ocean, for not pumping beyond Pump Station No. 2 and for a number of other assumptions). The cost of imported water delivered to the City of San Diego was (1976) $225/million gallons. A key cost factor is the requirement for a distribution system - construction and operation and maintenance.

Some of the alternatives/systems considered in the Facilities Plan and Addendum are very supportive of reclamation because they 1) provide central city and/or South Bay facilities which are closer to potential reclaimed water markets; 2) provide secondary treatment which will greatly enhance the usability of the effluent; and 3) have available one or two outfalls which form backup disposal systems for times when there is no market (winter) or when effluent quality is below reclamation use quality. Reclamation possibilities are actively under study in San Diego. A $500,000 grant has been requested of EPA and the State Water Resources Control Board for research into reclamation techniques. CPO is studying reclamation as part of the areawide program.

Impacts of Treatment Plant Operations

Impacts of operation of a treatment plant and its interceptor lines relate to odor, energy use, noise, and potential accidents. A normally operating treatment facility produces a nonoffensive humic odor. However, should plant upset occur offensive odors from H_2S, NH_3, and other sulfides may result. Additional odor sources would include interceptor and trunk sewer vents and sludge handling operations. H_2S is the principal offensive odor from the interceptor vents as a result of anaerobic conditions in the pipe.

In a biological secondary treatment plant, the largest energy consumption is found in pumping operations, mixing and aeration. Disinfection requires energy both in application and/or generation at the plant and in the production of the disinfectant.

Although accident prevention measures are required before a NPDES permit may be issued, losses of power to the plant and additions of waste materials to the system that cause treatment plant upset are possible. Interceptor breaks or leaks are a possibility. Pipes carrying digested sludge to dewatering sites are also subject to breaks and leaks.

Potential impact of facility-generated noise was addressed in the site impact discussions as it related to adjacent land uses. The processes, type of equipment, housing, noise attenuation devices, and other factors govern noise levels from waste treatment facilities.

Impacts of the "No Action" Alternative

There are several aspects of the "no action" alternative in the San Diego metropolitan wastewater facilities plan. This EIS relates to the provision of Clean Water Grant funds to assist San Diego in the financing of their wastewater treatment system expansion. EPA's "no action" could result in a denial of funding. San Diego could still expand their system provided they could develop other sources for the funding and comply with state and federal law.

"No action" could also result in the facilities not being built. Since the existing facilities are nearing capacity and no abatement in increased flow appears imminent, treatment plant overload appears likely in the near future. Such overload would reduce the efficiency of the treatment facility and reduce the quality of the effluent. At some point the plant would become in violation of its discharge permit. Ultimately, orders would be issued and a connections ban would be placed on the treatment system.

Modifications to the existing plant are being considered (not as part of this proposed project) which would increase capacity of the existing facilities a few mgd. Such action could forestall plant overload for perhaps a year, but not resolve the capacity problem. The current capacity of the plant could be "stretched" through the use of chemicals. The Regional Water Quality Control Board-San Diego Region would have to approve such a change. Perhaps a 130 mgd capacity could be achieved.

A connections ban would have far reaching socio-economic impacts for the San Diego area if the ban were in effect for very long, particularly related to the construction industry, housing demand and housing prices. Degradation of the marine environment near the outfall would result as the quality of the effluent diminished.

In addition to the question of funding from EPA which required this EIS, is the question of San Diego's non-compliance with the Federal Water Pollution Control Act (PL 92-500) which mandated secondary treatment by July 1, 1977. Any enforcement action related to the federal law must come from EPA. Thus, EPA is in the position of administering the grant funds and enforcing the requirements for secondary treatment. "No action" in building the facility will only continue San Diego's non-compliance with the law.

Part of a "no action" alternative could include not providing capacity for Tijuana either by excluding it from the new system or by not continuing the acceptance of "emergency" flows. The direct impact of not including a provision for the wastewater flows of Tijuana in the system would be the continuing danger of sewage spill from the pump station adjacent to the border into the Tia Juana River Valley and estuary. The available data indicate a continuing increase in the sewage flow from Tijuana. The increased flow would place a greater strain on existing Tijuana facilities, thereby increasing the possibility of an accidental discharge. Tijuana does not appear to be proceeding rapidly toward construction of their own treatment facilities. New pumps are planned for the border pump station.

Impacts of the Numbered Alternatives 1-15 and 35, 36 and 37 (EIR 16 a, b and c)

As indicated in the previous chapter, some of the numbered alternatives were eliminated early in the review process. Alternatives 1 through 4 were rejected because they did not provide secondary treatment for the system and would, therefore, not be in compliance with the federal law (PL 92-500). Alternatives 5 and 6 were dropped from active consideration because they required extensive earthwork at Point Loma to accommodate a 200 mgd secondary plant. Alternatives 12 and 13 were rejected as viable alternatives because no solution was offered to the safe disposal of effluent from the North City site. Reclamation, storage or a new outfall were indicated as possible disposal options. Alternative 15 was rejected because it would abandon Point Loma completely, even the outfall, and transfer all operations to the South Bay. Such a waste of existing facilities is not justifiable.

Alternatives 7, 8, 9, 10, 11, 14 and systems/alternatives 35, 36 and 37 were retained for further study although several of these alternatives have impacts significant enough to place their viability in serious question. Alternatives 17 and 18 were discussed under the section on "Impacts of Sludge Treatment" and Alternatives 25, 26, 28 and 29 on Tijuana were discussed under the "Impacts of the 'No Action' Alternatives". Impacts of Alternatives 22, 23 and 24 on disinfection were discussed in Chapter V.

Alternative 7, shown in Figure VI-6 would split the metropolitan system in two. Part of the wastewater would be treated at Point Loma in a plant of about 95 mgd. The remainder of the flow would be treated at a plant either on the Naval Training Center site, Loma Portal site, or another central city site.

The impacts of construction depend on the site selected, and have been discussed in an earlier section. In all cases a new interceptor would be required from the termination of the twin force mains to the Point Loma treatment plant. Some construction may be necessary in the vicinity of Kellogg and Rosecrans Streets in the Point Loma residential neighborhood. From that point, construction would be in the Naval reservation area for a distance of about three miles. Extensive earthwork would be required at Point Loma.

Sludge would be digested anaerobically at each plant site and sludge would be pumped to Fiesta Island for drying. When Fiesta Island is developed, sludge could be pumped to Miramar for drying and reclamation. Construction of a new sludge line would have adverse impacts as listed earlier in this chapter in the "Impacts of Construction" section.

Selection of Alternative 7 would allow reclamation of the central city site's effluent in Mission Bay Park and Balboa Park. Reclamation would amount to about 10 mgd, therefore, 190 mgd would be discharged to the ocean.

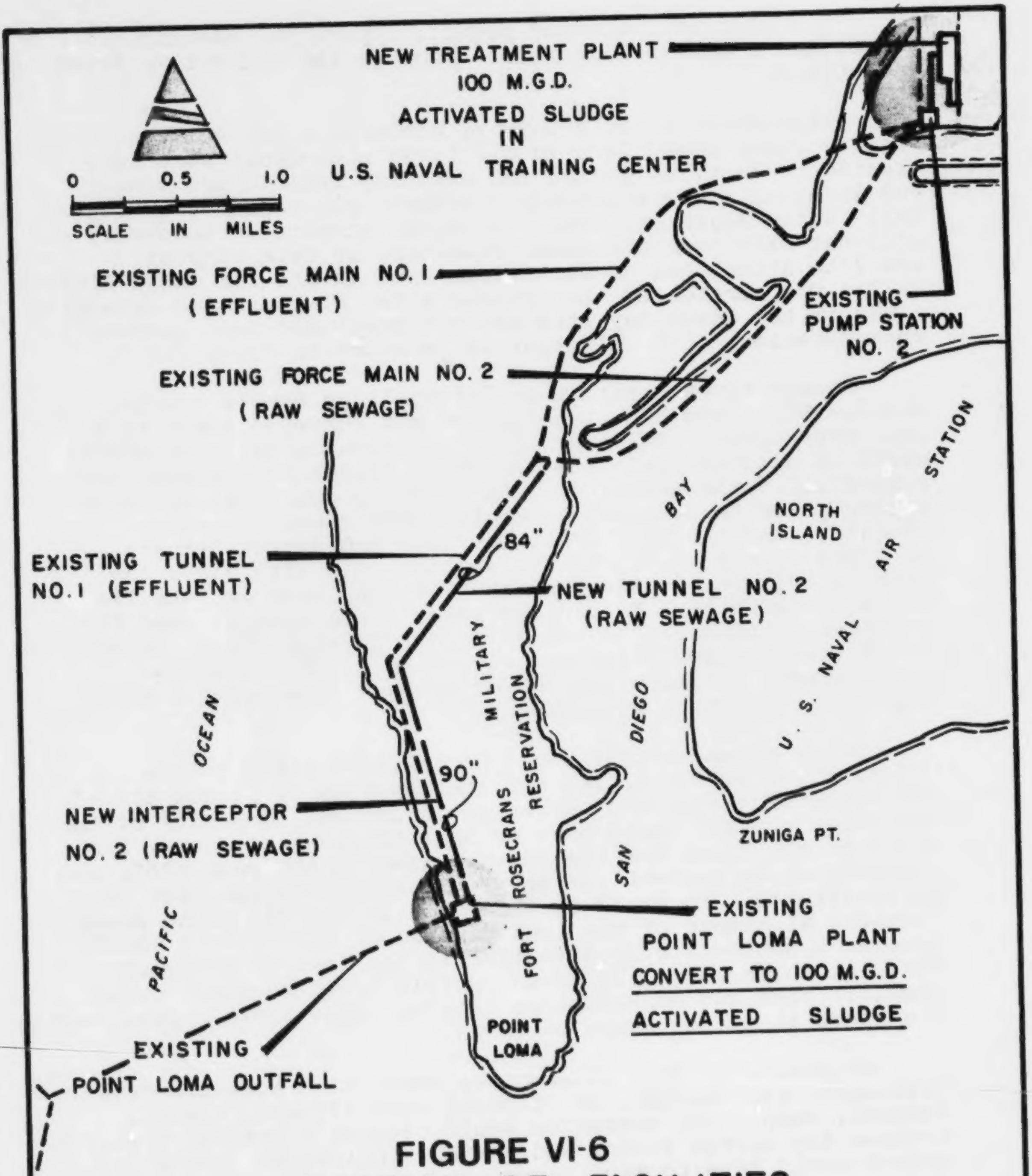


FIGURE VI-6
LOCATION OF FACILITIES

ALTERNATIVE NO.7

Source: Lowry & Associates, 1976.

This alternative would require a parallel 84-inch tunnel and a new 90-inch interceptor to the Point Loma treatment plant.

Alternative 8 would involve converting the existing primary Point Loma plant to a 115 mgd biological secondary treatment plant, splitting the existing interceptor system and locating a new secondary treatment plant and ocean outfall in the South Bay area. Disposal impacts of secondary effluent have been discussed elsewhere in this chapter. The 27th Street and Sunset Avenue site in the Tia Juana River Valley was considered the optimum site; however, the remaining sites in the South Bay area are not precluded from further consideration. This alternative is shown in Figure VI-7.

Sewage flows arriving at Metropolitan Sewage Pumping Station No. 1 would be intercepted and conveyed south by a new interceptor. Existing major intercommunity interceptors would be disconnected from the south branch interceptor and connected to the new line. The existing south branch interceptor would be retained to convey poor mineral quality sewage north to Point Loma. The 27th and Sunset Streets site would have excellent reclamation potential since the site is adjacent to the farmlands of Otay Mesa and the Tia Juana River Valley. Reclaimed water could also be used for groundwater recharge in the Tia Juana River Valley. Impacts of reclamation are discussed elsewhere in this chapter. Construction and site impacts of the new interceptors would depend on the route selected.

A new ocean outfall would be required although the existing one at Point Loma has the capacity to handle all of the wastewater from the metropolitan system. Capacity of the new ocean outfall would have to be sufficient to convey its share of the flows for the service area in the year 2000, and to function as back-up for any reclamation program that may be instituted. To avoid construction in the Tia Juana River Estuary, alignment of the land portion of the outfall could bear in a southwesterly direction to the foot of Monument Road, at which point the ocean outfall could be constructed. Specific site and construction impacts would again depend upon the exact alignment route selected.

Selection of this alternative would make possible joint treatment, reclamation, or disposal with Tijuana, Mexico. However, such joint operation would require a special treaty between the United States and Mexico. Discharge into U. S. waters would have to meet secondary treatment requirements, and if Tijuana discharged with San Diego, there would have to be a mechanism to enforce discharge requirements. If the discharge was in international waters, the discharge would

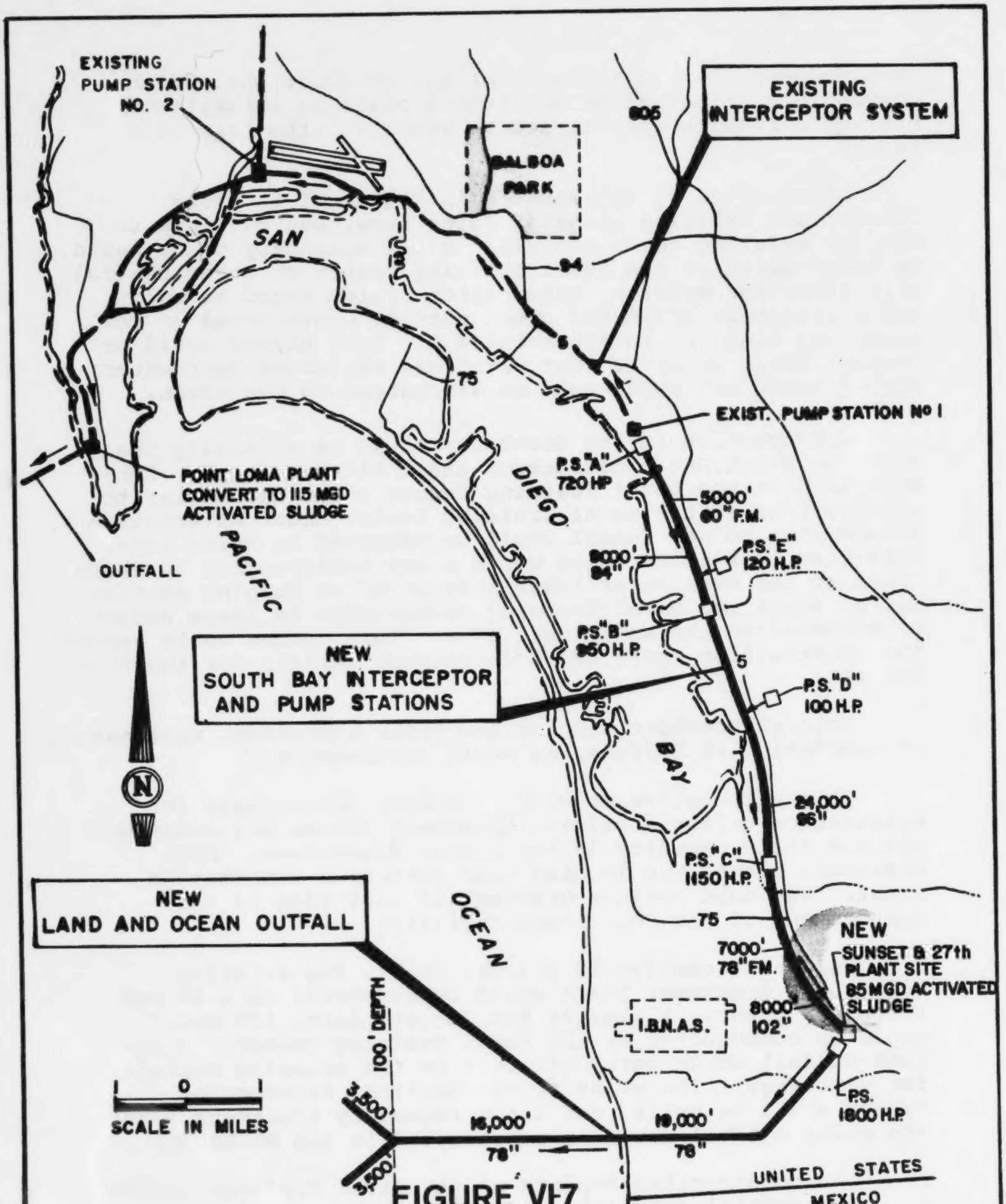


FIGURE VI-7
LOCATION OF FACILITIES

ALTERNATIVE NO. 8

Source: Lowry & Associates, 1976.

have to meet the requirements of the International Ocean Convention. Alternative conditions could be established, but would require special action again, in the form of a treaty.

Alternative 9, illustrated in Figure VI-8, would abandon the existing plant at Point Loma, but continue to use the existing ocean outfall. A new secondary plant would be constructed at the Naval Training Center or other central city site, the existing interceptor system would be split, and a treatment plant and ocean outfall constructed in the South Bay area, as in Alternative 8. Both plants would be located close to areas that might use reclaimed wastewater; any effluent not used would be discharged to the ocean.

Construction in the South Bay would be virtually identical to South Bay construction under Alternative 8. Construction at the Naval Training Center would be similar to construction at the Naval Training Center under Alternative 7, except that no new tunnel would be required in Point Loma. Selecting this alternative would allow intercepting southern flows at the Sweetwater River instead of at Pumping Station No. 1, since the Naval Training Center site is large enough to accommodate the additional flow. This option would reduce the construction costs and construction impacts for the South Bay site.

This alternative would allow joint operation, reclamation or disposal with Tijuana, as would Alternative 8.

This alternative provides the best opportunity for reclamation unless satellite treatment plants are constructed and their capacity is duplicated downstream. Both treatment plants are located near potential reclamation areas. The most serious drawback of this plan is the abandonment of the Point Loma facility.

Under Alternative 10 (Figure VI-9), the existing Point Loma treatment plant would be converted to a 45 mgd secondary plant. A similar but larger plant, 105 mgd, would be constructed at the Naval Training Center. A new land outfall would carry effluent to the existing outfall for discharge. The existing metropolitan interceptor system would be split, and a new secondary treatment plant and ocean outfall would be constructed in the South Bay.

The construction impacts at the Naval Training Center or other central city site and along the new outfall to Point Loma would be similar to those in Alternative 7. The

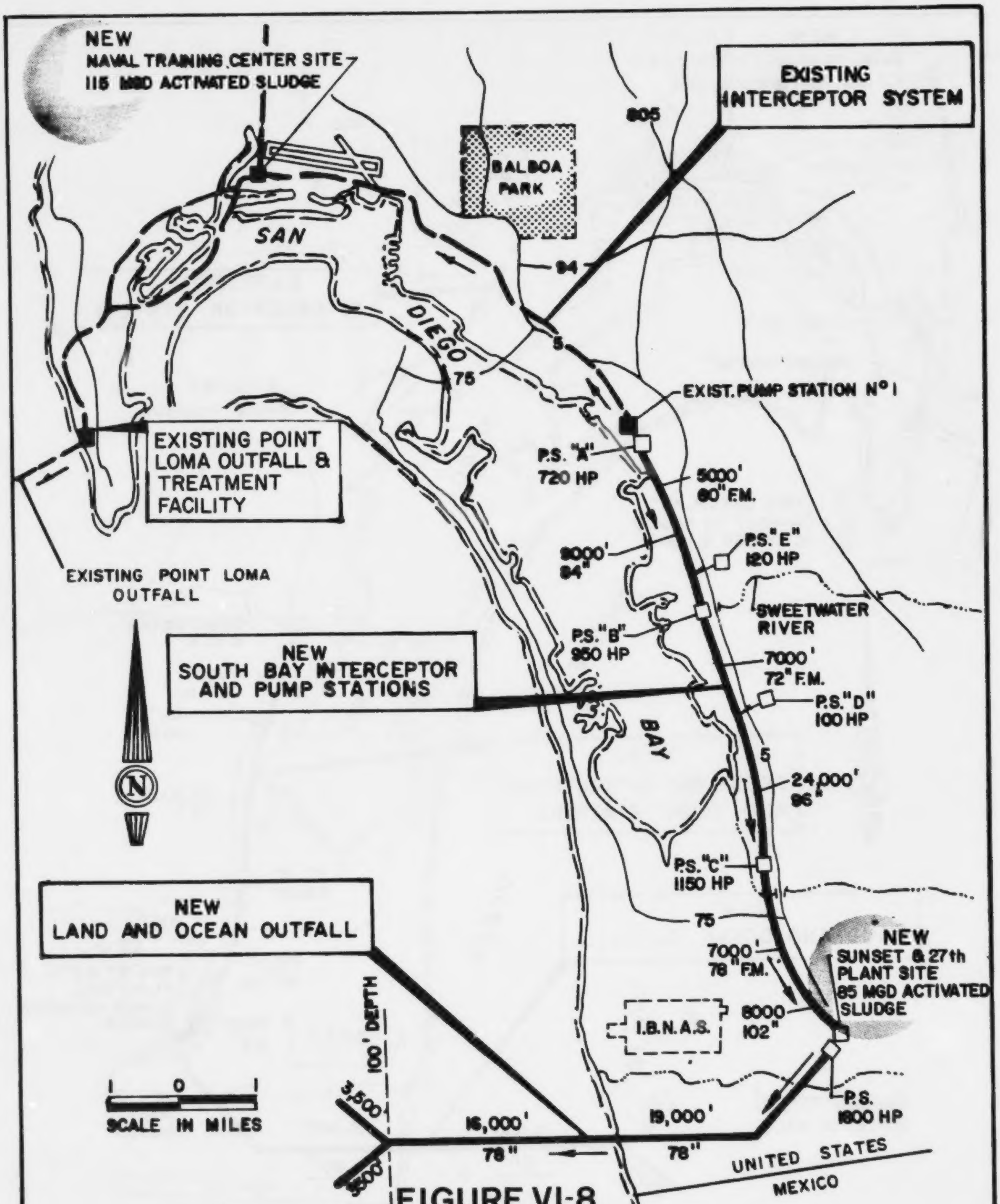


FIGURE VI-8
LOCATION OF FACILITIES

ALTERNATIVE NO. 9

Source: Lowry & Associates, 1976.

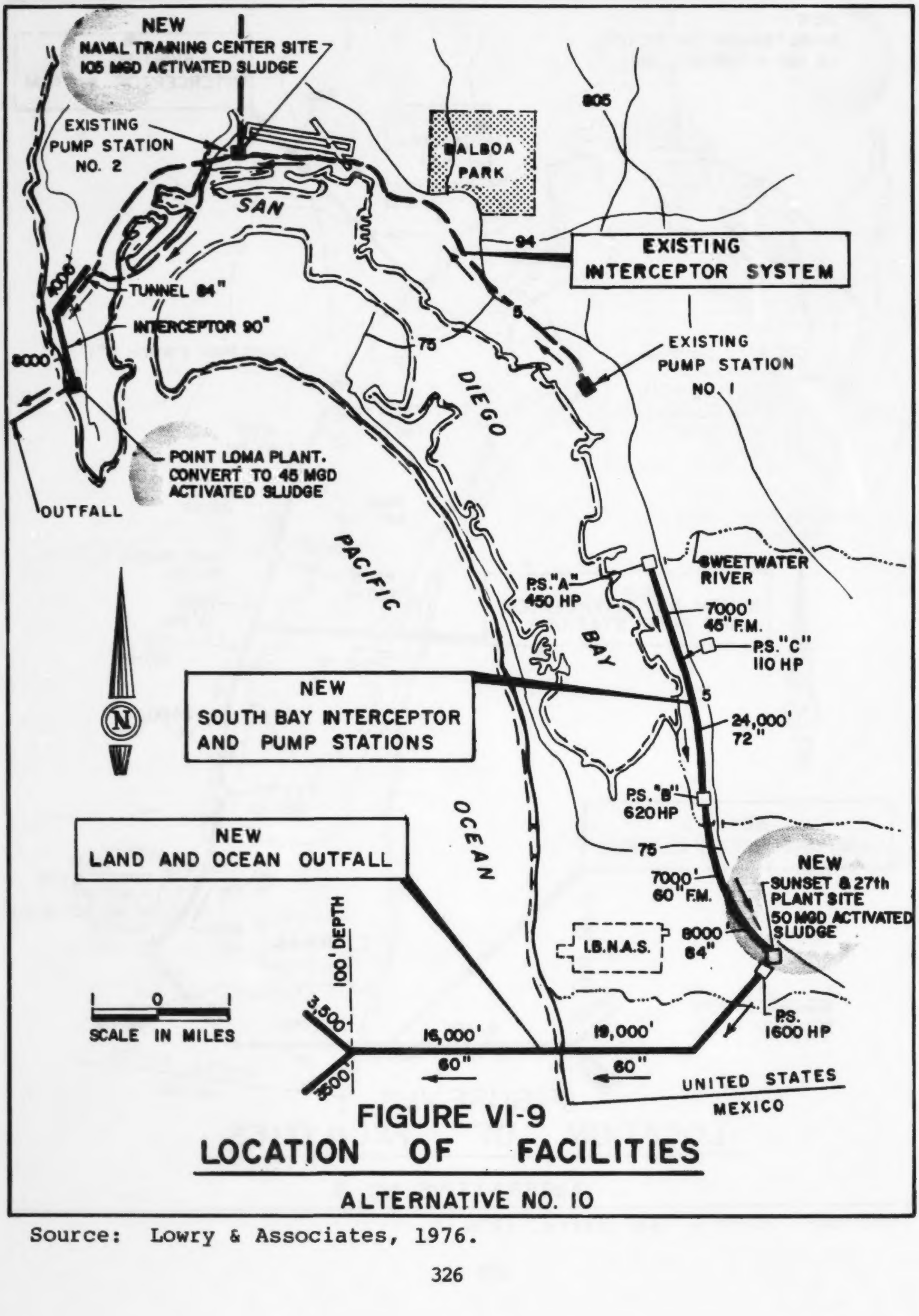


FIGURE VI-9
LOCATION OF FACILITIES

ALTERNATIVE NO. 10

Source: Lowry & Associates, 1976.

Point Loma site plant would be small enough to avoid the extensive excavation and associated problems that would result from a larger plant. Since the plant would continue to be used, the investment in the plant would not be lost. Impacts at the South Bay site would be similar to impacts under Alternative 8, except the site would be smaller. The interceptor system could be split at the Sweetwater River, minimizing adverse interceptor construction impacts. As with Alternatives 8 and 9, this alternative would allow joint treatment or disposal with Tijuana. Although some wastes would be treated and disposed of at Point Loma, this alternative has virtually as much reclamation potential as Alternative 9.

Alternative 11 (Figure VI-10) is very similar to Alternative 9. Point Loma is abandoned for treatment and treatment facilities are established at a central city and South Bay sites. The interceptor system would be split at the Sweetwater River, minimizing costs and impacts. The existing Point Loma site could be utilized to digest sludge, an option preferable to the loss of the facilities through abandonment.

The overall impacts of this alternative are almost identical to those of Alternative 9. Slightly less construction would be required in the South Bay, but more construction would be required at the Naval Training Center or other central city site. There would not be a need to parallel the Point Loma tunnel and interceptor. Again, the site would allow joint operation with Tijuana and would provide excellent reclamation potential.

Alternative 14, shown in Figure VI-11, would relocate treatment facilities to the Naval Training Center site. If the Naval Training Center site was unavailable, Loma Portal or other central city site could be used, but would require additional expenditures. Sludge could be treated at the central plant site, or a new sludge line could be built to transfer sludge to Point Loma where it could be treated in the existing facilities. Use of Point Loma for sludge treatment would decrease Naval Training Center site requirements by 3-4 acres, but would increase energy consumption due to increased pumping.

Selection of Alternative 14 would eliminate the necessity to reline portions of the metropolitan sewer system. Alternative 14 would require new pumping arrangements to transfer flow to the plant site, especially if Loma Portal or other central city site is used.

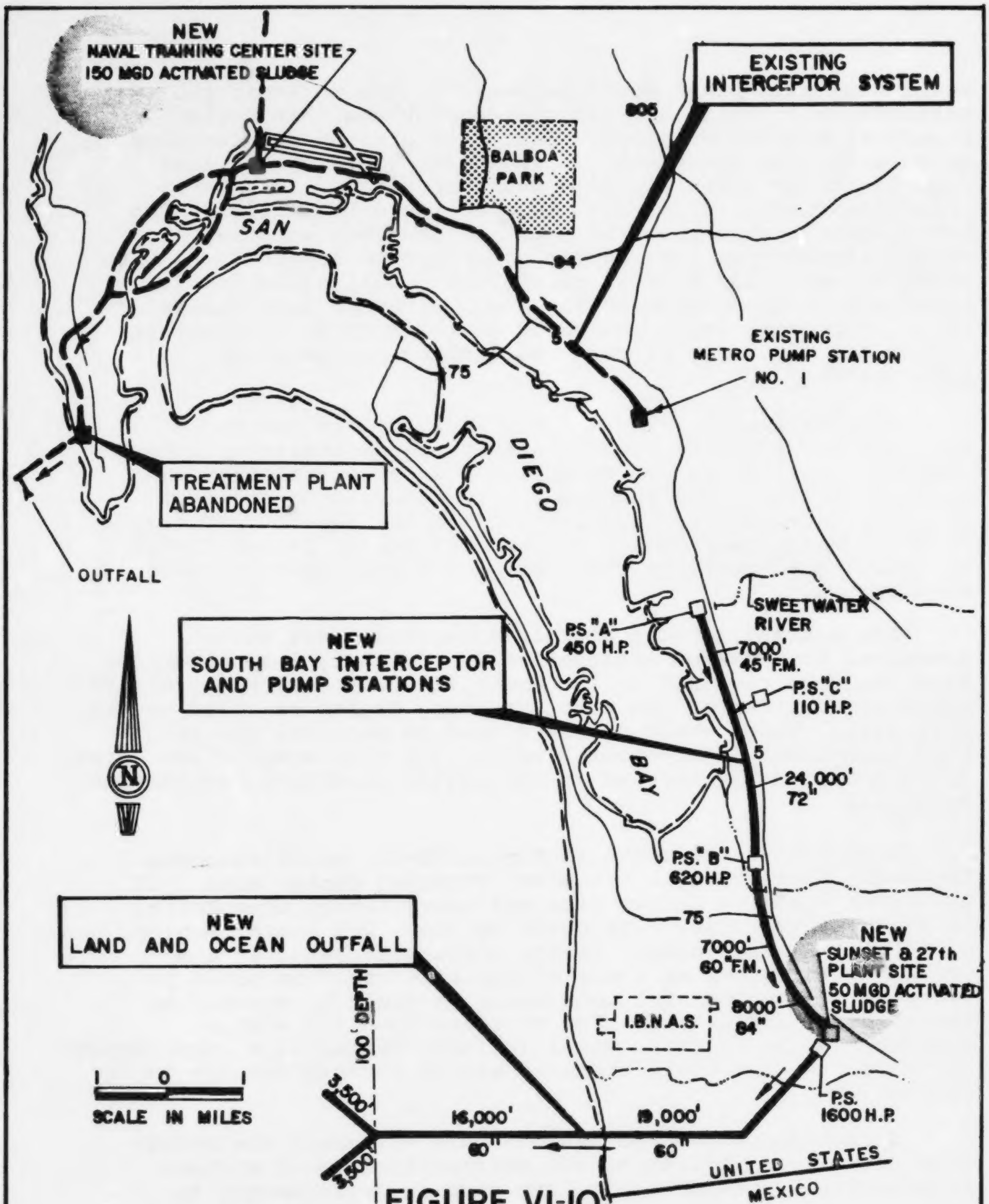


FIGURE VI-10
LOCATION OF FACILITIES

ALTERNATIVE NO. II

Source: Lowry & Associates, 1976.

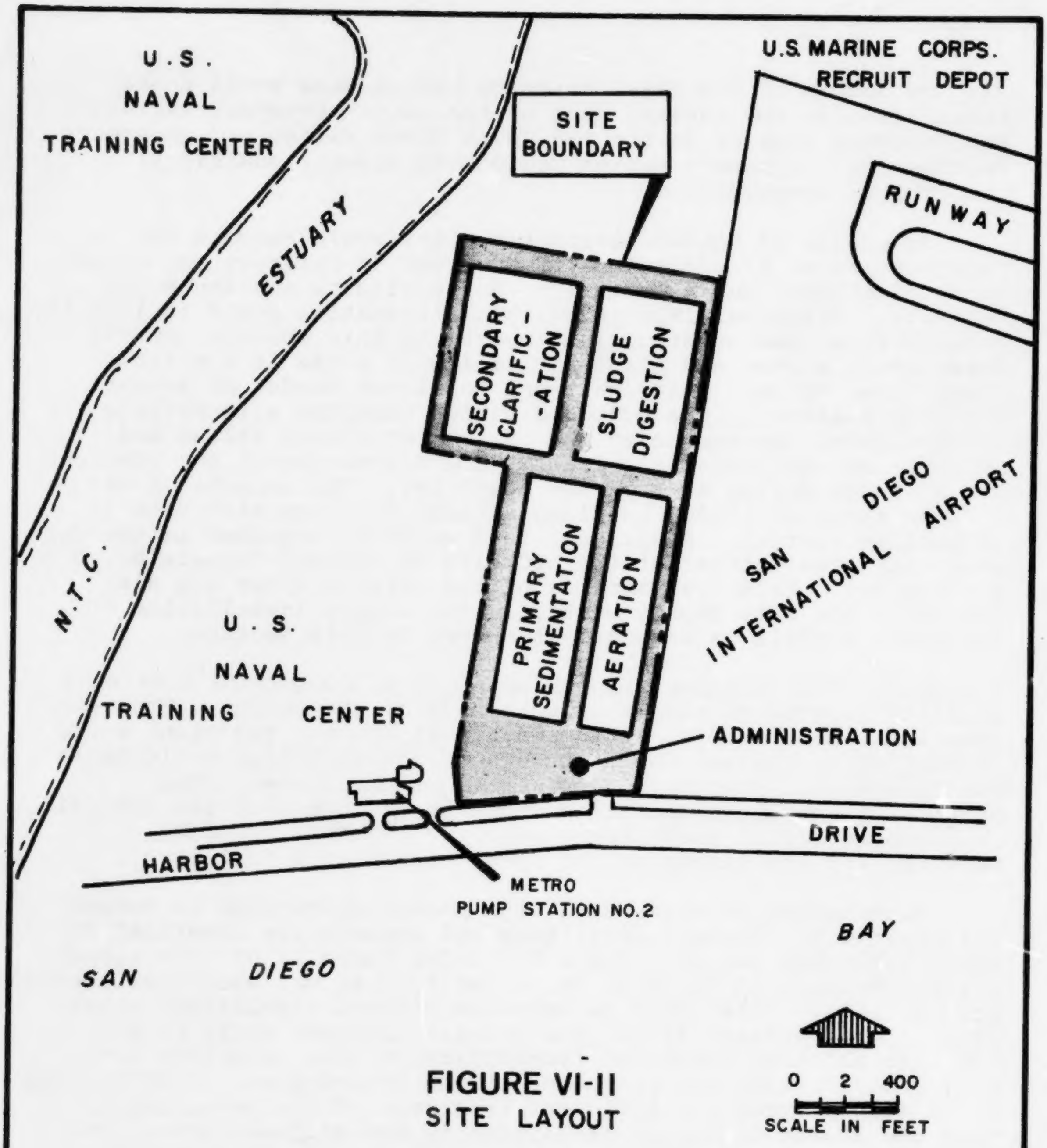


FIGURE VI-II
SITE LAYOUT

NAVAL TRAINING CENTER

200 M.G.D.
ACTIVATED SLUDGE
ALTERNATIVE NO.14

Source: Lowry & Associates, 1976.

Selection of the Naval Training Center site would enable reclamation in the central part of the city. However, reclamation on Otay Mesa or in the Tia Juana River Valley and emergency treatment of Tijuana's wastes would both require additional interceptor construction.

Selection of System/Alternative 35-1 would require the construction of an additional 69,000 feet of interceptor, as well as an additional ocean outfall to serve Tijuana and South Bay facility. Principal impacts of this alternative would include the construction (see construction impacts in this chapter) of the interceptor system and plant facilities at sites in the Tia Juana River Valley (Dairy Mart and Hollister Roads, or Sunset and 27th Avenues). The proposed sludge handling alternatives would require the continued use of land at Fiesta Island and possibly an additional 90 acres at the Miramar Naval Air Station and a sludge drying area in the South Bay. The impacts of the various types of sludge handling alternatives are discussed in an earlier section. Additional land would be required in the central city area, either at the NTC site or the old Convair No. 2 parking lot. Principal impacts of the various sites are discussed in the site impact section. The impact installation of the ocean outfall is assessed elsewhere in this section.

Flows from Tijuana would be handled by a separate treatment facility located on the California side of the border. This would entail the construction of an additional plant. The plant would be staffed by trained operators and no possibilities would exist for intermixing of flows from Tijuana and San Diego. The particular treatment operation would be tailored for the specific characteristics of the Tijuana sewage. Treaties would be required for the financing and operation of this facility.

Alternative (System) 36-1 is a phased conversion to secondary treatment. Phase I facilities and impacts are identical to those described for 35-1 Phase I. Under Phase II of this alternative, Point Loma would be converted to a 45 mgd biological secondary facility. This could be achieved without significant alteration of the present site. The central facility would be a 55 mgd size allowing increased flexibility in site selection and placement. Sizing and placement of the 45 mgd plant at Point Loma would also provide for efficient treatment of the supernatant from the sludge digestion facilities in use at Point Loma. The remainder of the impacts of this alternative are identical to those previously described.

Alternative (System) 37 would utilize the same phasing as described for 35-1 and 36-1 above. but would provide a joint treatment facility at the intersection of Hollister and Monument Roads. The advantages of a combined plant would include some possible cost reductions through the use of common lab facilities and operations buildings. Separate flow lines would be maintained through the plant so as to avoid intermixing of flows. A savings in land area can be expected from a combined facility. The South Bay interceptor would need to be extended to reach this site. Possible impacts of the Hollister/Monument Road site are discussed in an earlier section.

Under Phase II of this alternative, the facility would be increased to a total of 190 mgd. Additional land would be unavailable for agricultural production.

Alternative (Systems) 35, 36, and 37 select as an alternative sludge handling possibility, direct liquid sludge injection. The impacts of this process were discussed earlier in the sludge handling section.

Common to alternative (Systems) 35, 36, and 37 is the impact of continued discharge of primary treated effluent from Point Loma outfall. These alternatives anticipate a 10-year continuation of this discharge. With the construction of additional facilities, the effluent quality at Point Loma might improve somewhat because of the decreased plant loading which should be experienced if the additional facilities can be brought on line ahead of expected flow increases. The impacts of the discharge of primary treated effluent are discussed in another section.

Comparison of the Facilities Plan Addendum Recommendations

As indicated in Table V-17, the Facilities Plan Addendum contained four recommended wastewater treatment systems listed in order of their preference - System A, System A/B, System B or E, and Alternatives (Systems) 36/37. The various elements of each of these systems have been reviewed for their potential impacts earlier in this chapter.

Recommendation 1 (System A), increasing primary treatment capacity to 200 mgd at Point Loma, was rejected early in the EIS review because it did not comply with P.L. 92-500; would require additional land not available at the site; would impact the Cabrillo National Monument; was not considered a beneficial use of coastal lands; was not a good site for reclamation; etc.

The other three recommendations were carried through the impact review process of this chapter, and their impacts were analyzed under the various sections "Impacts of the Numbered Alternatives", "Plant Site Impacts", "Sludge Treatment Impacts", "Reclamation Impacts", and "Treatment Plant Impacts". Specific impacts can be found in each of these sections. All the recommendations had the same options for sludge disposal (except for different sites), reclamation/recycling, and industrial source control.

The second recommendation continued primary treatment at Point Loma and provided secondary treatment (30 mgd) at a central city site. Implementation of this recommendation would not be in compliance with P.L. 92-500 until at least 1987. At that time Phase II would connect Point Loma to a 45 mgd secondary facility and add 125 mgd to central city site. The central city site would have to be a large site, for by Phase II 155 mgd of secondary treatment facilities would be placed on the site. There is some question as to the availability of such a large site in the central city area. A central city location would have some reclaimed water market for landscape irrigation in parks and along freeways.

The third recommendation, Systems B or E, both comply with P.L. 92-500 secondary treatment requirements. System B offers during Phase I an option of 45 mgd of secondary treatment at Point Loma and 105 mgd of secondary treatment at a central city site. Phase II (1987) would add 50 mgd to the central city site. System E would place a 150 mgd secondary treatment facility at a central city site during Phase I and add 50 mgd during Phase II. Both of these alternatives require a large central city site, but would be close to some reclaimed water markets. System E discontinues use of Point Loma, which is wasteful of existing facilities.

The fourth recommendation splits the metropolitan system. During Phase I it provides 70 mgd of secondary treatment in South Bay (Tijuana joint facility - 40 mgd) while Point Loma continues with primary treatment. Phase II provides 55 mgd of secondary treatment at a central city site, converts Point Loma to 45 mgd of secondary treatment and expands South Bay by 30 mgd (50 mgd addition to the Tijuana facility).

This alternative does not comply with P.L. 92-500, but it does utilize the Point Loma site as opposed to Recommendation 3 (System E) which abandons Point Loma; and it does require a smaller central city site than Recommendation 2 (System A/B) or 3 (Systems B or E). The South Bay sites in the Tia Juana River Valley are in the floodplain, and some sites are not protected by the proposed flood control project. The provision of wastewater treatment facilities in the South Bay will accommodate the development of the Tia Juana River Valley and Otay Mesa. The locating of a facility in the South Bay area places it near potential reclaimed water markets for irrigation, salinity barriers, groundwater recharge, "live stream" programs, etc. The direct impacts of treatment facilities on flora and fauna are much greater for the South Bay sites than for central city sites or Point Loma. No studies have been undertaken to ascertain the impacts of the land or ocean outfalls at the on-and-offshore areas of the Tia Juana River and Estuary.

Ocean Disposal

Introduction

The present discharge is about 115 mgd of primary effluent. The amount of effluent is expected to increase to about 200 mgd by 2000. The effluent will be discharged either entirely at Point Loma or split between the Point Loma outfall and a southern discharge point (see project description in Chapter V and Table V-16 for details). The federal and state law and policy are expressed through the NPDES permit (Appendix A) which requires that the effluent receive secondary treatment by 1977 (see Chapter V). NPDES permit limitation on effluent constituents reflect attainable concentrations of pollutants. The fundamental reason for requiring secondary treatment is to reduce the amounts of pollutants discharged to the ocean and thereby reduce effects (impacts) on the marine environment that are directly and/or secondarily related to the discharge. The environmental effects are both measurable and inferential, and both conditions for describing effects are used to assess the overall impacts of ocean disposal.

Table VI-2 lists wastewater constituents that are typically assessed for setting effluent limitations and evaluating the efficacy of wastewater treatment plants. In this case the present Point Loma effluent characteristics are compared to the NPDES limits and projected effluent characteristics with secondary treatment. Among the pollutants for which there is analytical data, one can evaluate expected reductions in waste loading to be achieved by secondary treatment at the 1999 level of discharge.

Table VI-3

POINT LOMA OUTFALL
MASS LOADINGS IN POUNDS PER DAY AT PRESENT
AND AT 200 MGD (1999)

	1976-77 Primary	(1999) Primary	1999 Secondary	1999 PRI-SEC % Change
BOD_5	178,142	297,000	44,536	-85%
S.S.	121,097	202,000	77,000	-62%
Arsenic	1	1.7	1.2	-30%
Cadmium	16	27	13	-50%
Chromium	51	85	32	-62%
Copper	130.10	217	72	-67%
Lead	69.06	115.09	81	-30%
Nickel	86	150.10	108.09	-28%
Mercury	1	1.7	0.63	-63%
Zinc	175	292	134	-54%

Table VI-2

PRESENT AND PROJECTED AVERAGE EFFLUENT QUALITY IN COMPARISON TO NPDES PERMIT LIMITATIONS

Wastewater Constituent	Present Primary Effluent	NPDES Effluent Limits*	Projected Secondary Effluent
Flow, mgd	114	200	200
BOD_5, mg/l	185	30	26
Suspended solids, mg/l	126	30	46
Settleable solids, ml/l	15	0.1/0.2	<0.01
Grease and oil, mg/l	43	10.0/15.0	<10
Floating particulates, mg/m^2		1.0/2.0	
pH, units	7.36	6-9	
Turbidity, JTU	252	50/75	
Arsenic, mg/l	0.001	0.01/0.02	0.0007
Cadmium, mg/l	0.017	0.02/0.03	0.007
Chromium, total mg/l	0.053	0.005/0.01	0.019
Copper, mg/l	0.135	0.2/0.3	0.043
Lead, mg/l	0.072	0.1/0.2	0.048
Mercury, mg.l	0.001	0.001/0.002	0.00037
Nickel, mg/l	0.089	0.1/0.2	0.064
Silver, mg/l		0.02/0.04	
Zinc, mg/l	0.182	0.3/0.5	0.08
Cyanide, mg/l	0.001	0.1/0.2	
Phenolic compounds, mg/l	0.272	0.5/1.0	0.019
Ammonia (NH_3-N), mg/l	25.7	40/60	
Total chlorinated hydrocarbons (less PCB's), mg/l	0.00089 (total DDT)	0.002/0.004 (total identifiable hydrocarbons)	0.00015 (total DDT)
Polychlorinated biphenyls, Mg/l	0.00163		0.000163
Toxicity, toxic units	1.5	1.5/2.0	
Total chlorine residual		1.0/2.0	

* After July, 1977 or 1978, depending on substance (see Appendix A) paired numbers indicate levels to be exceeded not more than 50 percent of the time and 10 percent of the time, respectively.

Radioactive substances in effluents are not to exceed limits found in Title 17, Chapter 5, Subchapter 4, Group 3, Article 5, Sections 30285 and 30287 of the California Administrative Code.

The question of analytical accuracy in such estimates is moot, but it does illustrate significant reductions in the amount of measured pollutants that would be discharged to the ocean daily at the end of the 20-year project planning period. With about a 74 percent increase in the amount of effluent discharged between 1977 and 1999, there will be significant reductions in biochemical oxygen demand (BOD_5) and suspended solids with secondary treatment (85 and 62 percent respectively). The secondary treatment data indicate that the amounts of heavy metals discharged in 1999 would be greater than at present, but 25-50 percent less than what would occur if primary treatment is retained. Although incomplete, the data indicate a significant reduction in waste materials discharged to the ocean which affirms the fundamental reason for requiring secondary treatment. Reductions in discharged waste materials mitigate any adverse effects waste constituents may have on the physical environment and biological resources. Consequently, reductions in waste loading are considered a major beneficial impact of secondary treatment.

Table VI-2 indicates that NPDES limits will not be met by projected secondary effluent for two substances, chromium and suspended solids. Chromium concentrations in secondary effluents are typically higher than established standards; reasons for this are unclear. No solution to this problem is readily available. Suspended solids concentrations in secondary effluents are an indicator of the quality of treatment plant operation and maintenance. The projected level given in Table VI-2 is based on present primary treatment removal efficiencies, which are poor. A properly operating secondary treatment plant should have no difficulty meeting NPDES limits.

Although the total load may be split at a ratio of 100:100 mgd between Point Loma and the outfall near the Mexican border, the regional waste load would not differ significantly.

Beyond what is measured and used to demonstrate reductions in pollutants, secondary treatment can be inferred to reduce the risk of pollution by many substances that are not identified or routinely measured. Lists such as Table VI-3 contain only a portion of the chemical substances in wastewater. Those listed have been studied, especially the grouped characters, e.g., BOD, suspended solids, acute toxicity, heavy metals and nitrogen forms. Organic compounds in effluents are relatively unmeasured and unstudied.

A measure of environmental safety is assumed to be derived from secondary treatment in that a specialized flora and fauna is used to alter and stabilize organic substances entering the treatment process. Bacteria, fungi, and other organisms adapt to the available energy sources, utilizing such wastes for food and in the process cause physical and chemical changes that are assumed for the most part, to be beneficial to receiving water biota. The adaptation of decomposing organisms to their complex environment is a key feature of biological treatment. One can assume that substances, which would be toxic, carcinogenic or otherwise debilitating to plants and animals in the natural ocean environment are consumed by organisms adapted to their use, and in this process converted to potentially less harmful forms.

Pollutants discharged directly to the ocean without the opportunity for biological stabilization afforded by secondary treatment are encountered by marine organisms which may not be able to metabolize, reject or detoxify these exotic substances. Immediate death or disabilities eventually leading to death or lowered productivity probably occurs among individual species leading to alterations in the community structure.

Sometimes these changes are measured but more often small changes go unnoticed and unrecorded. Interests in the effects of effluents on habitat and biota typically center either on resources used by humans and/or on those environmental features that the community of scientists can measure.

In subsequent sections of this discussion, the dilution and dispersion characteristics of the effluent will be summarized to provide background for the evaluations of pollutants relative to project alternatives. Project alternatives in the disposal case are no action (continuation of primary treatment) and secondary treatment with disposal at Point Loma and/or offshore north of the international boundary with Mexico.

Dilution and Dispersion

A description of the present outfall environment and the possible southern discharge area is given in Chapter II. General environmental conditions relating environmental characteristics to the discharge locations are also summarized in Chapter II. More detailed analysis can be found in the cited literature for Point Loma. Information about the discharge location near the Mexican border is meager.

Typically the present discharge of about 115 mgd of primary effluent does not reach the surface except for brief periods between December and February. The plume rising from the diffuser and achieving an initial dilution slightly greater than 112:1 disperses below the thermocline at depths of about 40-60 feet. Diluted wastewater generally disperses below the thermocline parallel to shore within the 60 to 300 foot depth contours. During some winters the discharge plume reaches the surface and achieves an initial dilution of about 253:1. Surface discharges happen about 10 percent of the time during any given year. At the surface the plume disperses in response to surface currents which reflect wind direction, velocity and duration (see Chapter II). The characteristics of the discharge plume meet state requirements for ocean discharge, i.e., a dilution factor of 100:1 at least 50 percent of the time and 80:1 at least 90 percent of the time.

Waste substances dispersed from the diffuser can initially have three general fates: settle to the bottom and become a substrate component, enter the biological system, or be physically dispersed as a component of sea water. Thereafter substances and elements may transfer by various mechanisms between biological, substrate and hydrologic components. The effects of waste constituents on habitats and biota are typically measured and interpreted in the context of the local ecology.

Coliform Concentrations Off Point Loma

The following account is taken from SCCWRP (1973).

The City of San Diego has monitored coliform concentrations in the Point Loma wastewater discharge area at the stations shown in Figure VI-12 since its marine outfall became operative in 1963. Twelve monitoring stations ("A" and "B" stations) and seven nearshore ("C") stations were sampled at the surface (0.5 meters) and at a depth of 5 to 6 meters once or twice a month. Nine beach stations ("D" stations) were sampled once or twice a week.

Table VI-4 summarizes the frequency of occurrence of coliform concentrations exceeding a level of 1,000 MPN/100 ml at the sampling stations between 1963 and 1970. At all but one of the sampling stations, the criterion of 1,000 MPN/100 ml was not exceeded 86 percent or more of the time. At Station A-8, immediately south of the wastewater outfall terminus, the criterion was exceeded in 42 percent of the subsurface samples. However, all of the 39 samples collected from the surface waters at this station had coliform concentrations of less than 1,000 MPN/100 ml.

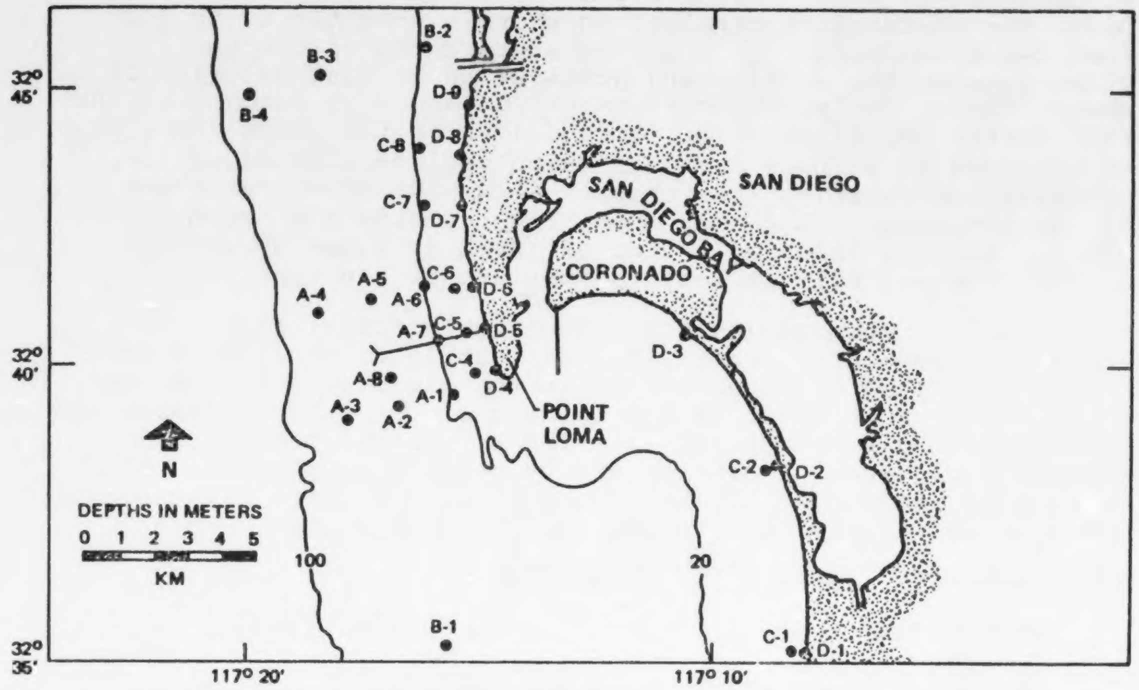


Figure VI-12. Point Loma Coliform Monitoring Stations

As expected, the frequency of occurrence of coliform counts exceeding 1,000 MPN/100 ml was greater in the subsurface samples than in the surface samples. In the area of this wastewater discharge, the wastewater-seawater mixture is normally below a depth of 15 to 20 meters. If the samples had been taken at this depth, the coliform concentrations might have been significantly higher than indicated in Table VI-4. The table also shows that the surface and subsurface waters at Stations A-3 and A-4 (both located west of the diffuser system) had a lower incidence of coliform counts exceeding 1,000 MPN/100 ml than did the waters at other "A" stations. These lower concentrations reflect the fact that, at this location, the net mean subsurface current over the outfall has a shoreward component with a speed of about 3 cm/sec (Water Resources Engineers 1965).

Relatively high coliform counts in the surf zone (beach stations) may be due to surface runoff and beach washout as well as to subsurface transport of wastewater.

Table VI-4

FREQUENCY OF OCCURRENCE OF COLIFORM COUNTS EXCEEDING 1,000 MPN/100 ML IN THE POINT LOMA WASTEWATER DISCHARGE AREA, 1963-70**

		Surface (0.5 m)		Subsurface (5-6 m)	
Station*	Distance From Outfall (km)	Total No. of Samples	% of Samples Exceeding 1,000 MPN/100 mL	Total No. of Samples	% of Samples Exceeding 1,000 MPN/100 mL
Offshore					
A-1	2.2	128	1.5	126	8.0
A-2	1.5	143	0.7	145	8.3
A-3	2.2	96	0	93	1.1
A-4	2.2	94	0	93	0
A-5	1.5	144	0.7	143	10
A-6	2.2	143	0	138	11
A-7	1.5	145	0.7	140	14
A-8	0.7	39	0	38	42
Offshore (Control)					
B-1	9	135	0	135	2.2
B-2	9	93	0	91	2.2
B-3	9	137	0.7	137	6.0
B-4	9	91	0	90	0
Nearshore					
C-1	15	85	0	31	3.2
C-2	12	86	0	26	4.0
C-4	3	125	0.8	56	3.6
C-5	2.5	120	0	61	10
C-6	3	124	0	67	6.0
C-7	4.5	132	0.8	134	6.0
C-8	6	133	0.8	131	11.5
Beach					
D-1	15	149	5.4		
D-2	12	149	2.7		
D-3	9	147	11.5		
D-4	3	176	2.8		
D-5	3	176	14.0		
D-6	3	170	1.2		
D-7	5	174	4.6		
D-8	6.5	176	6.2		
D-9	7.5	173	1.7		

* Station locations shown on Figure VI-12.

** Source: SCCWRP, 1973

Physical and Chemical Impacts

The impact of present and possible future waste loading with and without secondary treatment is illustrated in Table VI-3. The waste components identified in this list can individually or in combination have impacts on the physical habitat and biota.

Flow. The discharge of relatively fresh water into the marine environment has the opportunity to form a brackish water habitat within the space immediately surrounding the diffusers. Marine animals encountering this zone may be adversely affected depending on time spent in the plume and lack of tolerance for salinity less than ocean water (33-35 o/oo). During the 20-year planning period, the discharge is expected to increase from about 115 mgd to 200 mgd. Any adverse impact of this increase in fresh water on marine organisms is thought to be unmeasurable and insignificant in terms of the productivity prevailing in the marine community.

Biochemical Oxygen Demand (BOD_5). The 5-day BOD test is used to estimate the amount of organic matter in the waste that is readily decomposed by aerobic bacteria. Oxygen is consumed in the process, thus the test is used to determine if the decomposition of organic matter will lower ambient concentrations of dissolved oxygen (DO) in the receiving water. Depression of DO in open ocean areas from wastewater discharge is rarely measured. Although some small depression in DO could be calculated, there is no evidence that the present discharge depresses DO by measurable amounts. Any lowering of DO from saturation is thought to be disadvantageous to most organisms although almost all animals can tolerate relatively low DO for short periods of time. If primary treatment were continued the daily BOD load would be about 297,000 pounds per day in 1999, whereas secondary treatment would reduce the daily load by about 85 percent to 44,536 pounds/day. By increasing the level of treatment to secondary the potential for depressing dissolved oxygen concentrations in the vicinity of the wastewater discharge all but vanish. The expected BOD_5 concentration in the secondary effluent will be about 26 mg/l in contrast to the present concentration of 178 mg/l. The EPA effluent requirement is 30 mg/l which is also the requirement in the NPDES permit.

Suspended and Settleable Solids. Suspended solids in the San Diego effluent will be reduced from a present average of 126 mg/l to less than 50 mg/l by secondary treatment (Table VI-2). Secondary treatment should reduce the load of suspended solids discharged to the ocean by about 62 percent. Settleable solids will be reduced from a present average value of 15 mg/l to <0.1 (CSDOC, p. VI-13).

A major benefit achieved by removing the solids before discharge is the concomitant removal of heavy metals and other substances that adsorb to mineral and organic particles. Although heavy metals and chlorinated hydrocarbons are associated largely with particulate matter, the percentage of any particular substance adsorbed vs. dissolved will vary significantly with level and type of treatment (Chen and Lockwood, 1976). This phenomenon probably varies from plant to plant. The increased removal of pollutants by higher levels of treatment is considered greatly significant to the receiving environment.

In the San Diego case, the present average daily discharge of 121,000 pounds of suspended solids would be reduced to about 77,000 by secondary treatment. Annually this could amount to 22,000 tons vs. 14,000 tons -- an annual reduction of about 8,000 tons of suspended solids entering the ocean. Many adsorbed pollutants would also be removed from the discharge. The discharged suspended solids cause locally increased levels of turbidity in the vicinity of the diffuser and carry adsorbed pollutants into the ocean where they are dispersed by currents. Current velocities are such that these solids do not become a major component of the local sediment.

It is difficult to assess the effects of low-level discharges of suspended solids on the marine environment. Obvious acute effects such as siltation are not apparent with secondary effluents, because the discharged solids tend to remain suspended and be transported and dispersed due to their fine particulate nature. In addition, the physical and biological breakdown of suspended organic matter contributes substantially to minimizing the gross physical impact of discharged solids. However, refractory chemical substances such as trace metals, synthetic and organic chemicals and certain pesticides may be widely distributed throughout marine waters, adsorbed to sediments and accumulated by organisms. It is hypothesized that the biological breakdown of many exotic substances proceeds slowly because organisms have not evolved to deal with such substances. To the extent that exotic substances enter the ocean ecosystem and accumulate beyond the natural rate of decay (and removal by factors such as sediment adsorption and biological degradation), they must be viewed as low-level pollutants which could, under the appropriate set of circumstances, reach damaging concentrations in the marine environment.

Settleable solids, on the other hand, may enter the bottom sediments near the point of discharge, changing the physical makeup of sediments and adding waste constituents to this environment. Heavy metals and petroleum are notable in this sense and sediments 8-10 miles from the Point Loma discharge show influences of the waste discharge in terms of BOD and heavy metals concentrations (see Figures II-22 and 23).

Sediments showing evidence of pollutants have been decreasing in areal extent since the discharge of sludge through the outfall was prohibited (Orlob, 1975). Reductions in the mass loading of settleable and suspended solids by secondary treatment should in the long term further reduce the area measurably affected by the Point Loma discharge. The benthic infaunal community will probably respond to such changes with lower biomass but greater numbers of species.

Grease, Oils and Floatable Substances. Secondary treatment greatly reduces the discharge of grease and oil; whereas primary treatment typically removes 40-60 percent, secondary treatment removes about 85 percent. Secondary effluent has less than one percent of the floatables contained in the raw waste influent. Any floatables remaining in the effluent will be greatly dispersed and the nature of the submerged discharge and lateral shoreline drift is such that floatables are not expected to reach shore. Any grease and oil remaining in the effluent after secondary treatment is probably resistant to biological degradation and may persist for relatively long periods in the environment; with secondary effluent grease and oil concentrations of less than 10 mg/l there will be no foreseeable direct effects on marine organisms, because, after initial dilution the concentration could be less than 0.1 mg/l. However, some of the dilution water is diluted wastewater so the actual receiving water concentration is probably slightly greater than the initial dilution factor indicates.

Turbidity. Reductions in particulate, colloidal and dissolved substances will decrease effluent turbidity. Reductions in particulate matter (suspended and settleable solids) is of major importance. Secondary treatment should reduce the present level of effluent turbidity. The discharge of a turbid effluent has affected ocean water clarity near the outfall (Figure II-34). Because of the wide range in natural turbidity, secondary treatment may reduce the receiving water turbidity to levels that are indistinguishable from the background as commonly measured.

Reductions in receiving water turbidity should cause the affected area to return to an ecological condition similar to surrounding waters. Light penetration will increase and thereby alter photosynthetic processes and possibly species composition among phytoplankton.

pH. The pH of the receiving water was described briefly in Chapter II. The effluent pH falls within the NPDES effluent limitations of 6-9. Initial dispersion and the large buffering capacity of sea water will quickly cause the effluent to become indistinguishable from abient background. Consequently, the pH of the effluent is assumed to have no measurable effect on the physical habitat or indigenous biota.

Temperature. The temperature of the effluent is a factor in the initial rate of dilution but is considered inconsequential relative to impacts on biota. During the initial dilution process plume temperature reaches ambient background temperature very rapidly, perhaps less than one minute after discharge.

Nutrients

Biodegradable Matter and Inorganic Nutrients. A key factor used in facilities planning for selection of the type of treatment process and level of treatment (Chapters II, V, and VI) needed for ocean disposal was EPA's definition of secondary treatment, which specifies a BOD_5 removal of 85 percent or greater. Discharge of BOD, a simple measure of the amount of biodegradable material in a wastewater, into a receiving water can have two major effects: it creates an oxygen demand which can depress and deplete dissolved oxygen resources; and it supplies dissolved and suspended organic food and nutrients which can support and stimulate marine productivity. Such increases in productivity can be beneficial (enhancing fish biomass) or detrimental (supporting increases in sea urchins which destroy kelp). Discharge of BOD into marine waters through deep ocean outfall diffuser systems is generally of little concern with respect to causing algal blooms or other aberrant conditions associated with accelerated biological productivity. However, future flow increases will result in increased inputs of organic material and other nutrients that will eventually offset the immediate reductions achieved by secondary treatment. The exact extent of these changes, given the uncertainties regarding future wastewater flow projections, source control, wastewater reclamation, etc., are not known.

Effects of the outfall structure itself in attracting fish, providing substrate for sessile flora and fauna, and the biostimulatory effect of inorganic nutrients (mainly nitrogen compounds), would be essentially unchanged by the proposed treatment upgrading.

Present concentrations of nitrogenous compounds in the primary effluent (36.8 mg/l total nitrogen based on July 1973-January 1975 recordings) would be only slightly decreased with upgrading to secondary treatment. The other major nutrient, silica, would not be expected to change as a result of constructing full secondary treatment facilities.

Secondary treatment does not significantly reduce nutrient levels beyond primary treatment levels. Some nutrients are removed by the increased efficiency in removing solids. Treatment can play a role in the form of nitrogen discharged, i.e., whether it is organic, ammonia or nitrate. With secondary treatment the inorganic forms predominate.

Toxic Materials

Secondary treatment combined with source control will reduce inputs of toxic materials over what would occur with primary treatment. The total effectiveness of existing efforts will not be known until secondary treatment is implemented, perhaps 1980. Water conservation, changes in water supply, and changes in the use or types of household products and other urban activities could also affect the toxicity component in San Diego's wastewaters. The *in situ* effects of toxicants are poorly understood; however, research is continuing, and knowledge of which constituents are harmful and how they affect the marine environment is increasing. New regulatory controls on toxic constituents are now being proposed in the state's water quality control plan for ocean water, and could influence final treatment process selection and source control efforts. Literature reviews done for reanalysis of the present ocean plan by the SWRCB are used extensively in this section of the EIS.

Acute Toxicity. The completion of secondary facilities now being planned, combined with source control efforts (Sewer Use Ordinance restrictions) will allow the city to provide a level of treatment which will achieve the NPDES toxicity limitation of 1.5 toxic units (TUs) not more than 50 percent of the time, and 2.0 TUs not more than 10 percent of the time.

Acute toxicity as measured by fish bioassay and reported in median tolerance limits (TL_{50}) is converted for comparative purposes to toxic units (Esvelt, et al., 1971).

$$\text{Toxic Units (TU)} = \frac{\text{toxicant concentration}}{\text{96-hr } TL_{50}}$$

Unchlorinated primary effluents characteristically demonstrate an acute toxicity of 25-75 percent or 1.7-2.7 toxic units (Esvelt, et al., 1971). Implementation of full secondary treatment will achieve a greater reduction in toxicity (as low as 0.4 toxic units). More recent data (CSDOC, 1977) show acute toxicities of 1.1 to 1.8 TU for primary treatment, and less than 1.0 for secondary treatment (activated sludge). This reduction is an indication that improved treatment reduces effluent concentrations of many toxic materials and thus reduces the potential for adverse impacts on sensitive marine species. One hundred to one or greater initial dilution and rapid dispersion affords protection from acute toxicity. Standards proposed for the protection of aquatic life for certain toxicants are shown in Table VI-5.

The marine standards proposed by the SWRCB are presently tentative and were derived from a draft SWRCB report (Larry Klapow, pers. comm.). The research supporting these and other toxicity limits is documented in the SWRCB draft report (staff proposal for amendments to Table B of the Ocean Plan, September 1976 draft). Table VI-6 contains acute toxicity data from the SWRCB draft report compared with Point Loma effluent (primary and secondary) characteristics.

There does not appear to be any case involving known toxicants where acute toxicity is likely impact of discharge at Point Loma. Concentrations occurring after dilution to 100:1 or greater appear to be less than standards proposed for the protection of marine life (Table VI-5).

Chronic Toxicity. Chronic toxicity is taken to include all effects of pollutants which do not cause immediate death but tend to diminish the viability of an organism. Chronic toxicity need not lead to premature death but can adversely affect ability to perform normal ecological functions. Quite often these effects lead to alterations in population size and/or community structure and may therefore diminish the value of a resource. Most toxicants discharged to the ocean can cause chronic disabilities which have a variety of symptoms. Table VI-7 illustrates some of the results of research in this area.

Few studies have been done to determine the long-term effects on marine organisms from continuous exposure to small concentrations of toxic pollutants. Sublethal effects can have drastic effects, and the damage may not be detected for years or until irreversible damage has been done. Effects on photosynthesis, reproduction, or ability to survive are difficult to quantify in the field. Concern over trophic accumulation is growing as man's knowledge of environmental pollution increases. The present state of knowledge indicates that prevention and/or reduction of pollutant discharge to be the safest course of action. Improved treatment and source control will reduce effluent toxic pollutant concentrations.

TABLE VI-5

COMPARISON OF WATER QUALITY STANDARDS
(µg/l)

Constituent	Standards Proposed for Protection of Marine Life			Present Requirements*	
	Proposed by California	Proposed by SCCWRP[1]	Recommended by EPA[2]	50% of time (P50)	10% of time (P90)
Arsenic	8	--	--	0.1	0.2
Cadmium	3	2	5	0.2	0.3
Chromium	2	4.4	100	0.05	0.1
Copper	5	2	~5	2	3
Lead	8	32	~12	1	2
Mercury	0.14	0.24	0.10	0.01	0.02
Nickel	20	22	100	1	2
Silver	0.45	0.11	--	0.2	0.4
Zinc	20	14.6	~9	3	5
Cyanide	5	--	5	1	2
Phenol	300	--	1	5	10
Total Chlorine Residual	6	--	10	10	20
Ammonia-Nitrogen	600	--	--	400	600

Source: State Water Resources Control Board.

[1] SCCWRP numbers are proposed as limits on the soluble fraction of waste constituents.

[2] EPA has not recommended specific numerical concentration limits for Cu, Pb, Ag and Zn. Rather EPA has specified safety factors which are to be applied to concentrations which are found to be acutely toxic to sensitive resident marine specimen. Using the EPA approximate numerical limits have been calculated for Cu, Pb, and Zn.

* Based on 100-fold dilution of effluent discharge limits set by Water Quality Control Plan for Ocean Waters of California, SWQCB, 1972.

Table VI-6

EXISTING AND PROJECTED POLLUTANT CONCENTRATIONS IN PT. LOMA EFFLUENT COMPARED TO CONCENTRATIONS EXHIBITING ACUTE EFFECTS ON MARINE ORGANISMS

	Concentration (mg/l = ppm) Undiluted Effluent			Concentration (ppm) Diluted Effluent (100:1 dilution)			ppm Concentration			
Constituent	Existing Effluent	Primary 1999	Secondary 1999	Existing Effluent	Primary 1999	Secondary 1999	Laboratory Bioassay	Species	Acute Toxicity (Death)	Reference
Trace Metals										
Cadmium	.016	.016	.011	.00016	.00016	.00011	.22 as Cd	Capitella capitata Marine polychaete worm (larvae)	96 hour acute toxicity TLM[1]	Reish, et al, (1976)
Chromium	.051	.051	.026	.00051	.00051	.00026	3.0 as Cr^{+6}	Neanthes arenaceodentata Marine polychaete worm	96 hour acute toxicity TLM	Oshida & Reish, (1975)
Copper	.130	.130	.078	.0013	.0013	.00078	.09 as Cu	Macrocystis pyrifera Giant kelp	96 hour acute toxicity TLM	Inst. Marine Resources, (1964)
Lead	.069	.069	.059	.00069	.00069	.00059	1.2 as Pb	Capitella capitata Marine polychaete worm (larvae)	96 hour acute toxicity TLM	Reish, et al, (1976)
Mercury	.001	.001	.0006	.00001	.00001	.000006	.014 as Hg	Capitella capitata Marine polychaete worm	96 hour acute toxicity TLM	Reish, et al, (1976)
Nickel	.088	.088	.0660	.00088	.00088	.00066	1.0 as Ni	Macrocystis pyrifera Giant kelp	96 hour acute toxicity TLM	Inst. Marine Resources, (1964)
Silver							.0088 as Ag	Crassostrea virginica American oyster	≤48 hour acute toxicity TLM	Calabrese & Nelson, (1974)
Zinc	.175	.175	.114	.00175	.00175	.00114	0.9 as Zn	Neanthes arenaceodentata Marine polychaete worm (juvenile)	96 hour acute toxicity TLM	Reish, et al, (1976)
Other Toxicants										
Ammonia	25.7	25.7	23.13	.257	.257	.231	~26 as N	Morone saxatilus Striped bass	96 hour acute toxicity TLM	Hazel, et al, (1971)
Phenol	.272	.272	.019[5]	.00272	.00272	.0002	<10	Morone saxatilus Striped bass	48 hour acute toxicity TLM	Wilson & Hazel, (1971)
Cyanide	.001	.001	.00033	.00001	.00001	.000003	.25 as Cn	Pandalus montagui Pink shrimp	48 hour acute toxicity TLM	Portmann & Wilson, (1971)
Polychlorinated Biphenyls	.00163	.00163[5]	.00163	.0000163	.0000163	.0000016	.00001	Gammarus oceanicus Crustacean	Lethal after 30 day exposure	Wildish, et al, (1970)
Pesticides										
Aldrin	0-.0007	ND	ND	BDL	ND	ND	.004	Fundulus heteroclitus Mummichog	96 hour static bioassay LC50[2]	Eisler, (1970)
Chlordane	ND	ND	ND	ND	ND	ND	.011	Palaemon macrodactylus Korean shrimp	96 hour intermittent flow lab bioassay TL50	Earnest, (unpublished)
DDT[3]	.00089	.00089	.00015	.0000089	.0000089	.0000015	.0009 p, p[1] isomer	Mugil cephalus Striped mullet	96 hour static lab bioassay LC50	Eisler, (1970)
Dieldrin	BDL[6]	ND	ND	BDL	ND	ND	.004	Fundulus majalis Striped killifish	96 hour static lab bioassay LC50	Eisler, (1970)
Endrin	ND	ND	ND	ND	ND	ND	.0006	Fundulus heteroclitus Mummichog	96 hour static lab bioassay LC50	Eisler, (1970)
Heptachlor	ND	ND	ND	ND	ND	ND	.0008	Thalassoma bifasciatum Bluehead	96 hour static lab bioassay LC50	Eisler, (1970)
Lindane	ND	ND	ND	ND	ND	ND	.005	Crangon septemspinosa Sand shrimp	96 hour static lab bioassay LC50	Eisler, (1969)
Methoxychlor	ND	ND	ND	ND	ND	ND	.004	Crangon septemspinosa Sand shrimp	96 hour static lab bioassay LC50	Eisler, (1969)
Toxaphene	BDL	ND	ND	BDL	ND	ND	.007	Gasterosteus aculeatus Threespine stickleback	96 hour static lab bioassay TLM	Katz, (1961)

[1] TLM - Median Tolerance Limit: The concentration of a test material in a suitable diluent (experimental water) at which just 50 percent of the test animals are able to survive for a specified period of exposure.

[2] LC50 - Median Lethal Concentration: The concentration of a test material that causes death to 50 percent of a population within a given time period.

[3] Includes: pp-DDT, op-DDT, pp-DDD, pp-DDD-olefin, op-DDD, mp-DDD, pp-DDE, op-DDE.

[4] Not detected.

[5] Based on removal efficiencies reported in OCSD EIS 1977.

[6] Below detectable limits.

Source: State Water Resources Control Board, September 1976 Draft, Ocean Plan Amendment.

Table VI-7

EXISTING AND PROJECTED POLLUTANT CONCENTRATIONS IN PT. LOMA EFFLUENT COMPARED TO CONCENTRATIONS EXHIBITING CHRONIC EFFECTS ON MARINE ORGANISMS

Constituent	Concentration (mg/l = ppm)			Concentration (ppm)			EPA Minimum Risk Criteria (mg/l; ppm)	ppm Concentration Laboratory Bioassay	Species	Chronic Effect (sublethal)	References
	Undiluted Effluent			Diluted Effluent (100:1 dilution)							
	Existing Effluent	Primary 1999	Secondary 1999	Existing Effluent	Primary 1999	Secondary 1999					
Trace Metals	Same as Table VI-6										
Cadmium							.0002	.1	Phytoplankton	Reduced photosynthesis	SCCWRP, 1975
Chromium							.05	--	--	--	
Copper							.01	.01	Sea urchin (embryo) Paracentrotus	Abnormal development	Okubo & Okubo, 1962
Lead							.01	.014	Isopod Sphalroma pentadon	Modified sublethal response	Klock & Pearson, 1961
Mercury							<.0001	.0015	Sea urchin (embryo) Paracentrotus	Abnormal development	Wilber, 1969
Nickel							.002	--	--		
Silver							.0001	.002	Sea urchin (embryo) Paracentrotus	Delayed development of and caused deformation of larvae	Soyer, 1963
Zinc							.02	.25	Marine phytoplankton: Skeletonema costatum Thalassiosira pseudonana Phaeodoctylum tricornutum	Reduced photosynthesis and growth	SCCWRP, 1975
Other Toxicants											
Ammonia							0.1 (96 hr LC50) N.T.E. 0.01[1]	3.5-10	Chinook salmon Oncorhynchus tshawytscha	Reduction in growth and loss of equilibrium	Holland, et al. 1960
Phenol							0.05 (96 hr LC50) N.T.E. 0.1[1, 2]	6.5[2]	Trout[2]	Epithelial cell damage in 2 hrs; severe reproductive system damage in 7 days[2]	Mitrovic, et al. 1968[2]
Cyanide							0.1 (96 hr LC50) N.T.E. 0.005[1]	.01	Salmonid fish	Permanent inhibition of swimming ability (in fresh water)[3]	EPA, 1973
Polychlorinated Biphenyls							$<1 \times 10^{-6}$	.0001	Phytoplankton Rhizosolenia setigera	Inhibited growth	Fisher & Wurster, 1973
Pesticides											
Aldrin							--[6]	present	Oyster	Converts to dieldrin	EPA, 1973
Chlordane							--[6]	present	Oyster	Trophic accumulation	--
DDT[5]							--[6]	.001	American oyster Crassostrea virginica	Weight difference between control and experimental oysters	Lowe, et al. 1971
Dieldrin							--[6]	present	Grey whale	Trophic accumulation	Wolman & Wilson, 1970
Endrin							--[6]	present	Brown pelican	Trophic accumulation	Risebrough, et al. 1968
Heptachlor							--[6]	present	Bald eagle	Trophic accumulation	Krantz, et al. 1970
Lindane							--[6]	present	Sand shrimp	Trophic accumulation	Eisler, 1969
Methoxychlor							--[6]	present	--	No trophic accumulation	EPA, 1973
Toxaphene							--[6]	present	Bay mussel	Trophic accumulation	EPA, 1973

[1] LC50 - Median Lethal Concentration: The concentration of a test material that causes death to 50 percent of a population within a given time period. N.T.E. = not to exceed.
[2] Fresh water investigation.
[3] No data available for effects in salt water. However, EPA Minimum Risk Criteria is for salt water application.
[4] See Table VII-16a
[5] Includes: pp-DDT, op-DDT, pp-DDD, pp-DDD-olefin, op-DDD, mp-DDD, pp-DDE, op-DDE.
[6] Not detected.

Source: State Water Resources Control Board, September 1976 Draft, Ocean Plan Amendment.

After dilution and ocean mixing, concentrations of toxic pollutants entering the ocean will be below concentrations which are known to be chronically toxic to marine organisms (Table VI-7) considering first order food web effects. However, there is concern over secondary or higher order effects as a result of biomagnification of pesticides and other organic compounds which can be concentrated to high levels and eventually result in adverse effects to higher trophic levels including man. Rates of accumulation of contaminants have been found to vary as a function of numerous factors, including chemical structure of the contaminant, tissues/organs of the animal, species of organism, and environmental features such as temperature and salinity. Consequently, it is difficult to make accurate general statements about the overall effects of contaminant uptake in marine ecosystems.

Impacts of Existing Wastewater Discharge on Marine Life at Point Loma

Despite monitoring efforts in the Point Loma area since before wastewater discharge began, data on the impacts of discharge on marine life are limited. This is due in part to the nature of the monitoring programs, and to the subtle nature of chronic toxic effects. Ecological standards set by the NPDES permit for the Point Loma outfall are indicated below.

Ecological Standards.

1. The effluent shall not cause toxicity to exceed 0.05 toxicity units outside of the initial dilution zone.

2. The effluent shall not cause:

    a. A rate of deposition of inert solids and the characteristics of inert solids in ocean sediments to be changed such that benthic communities are degraded.

    b. The concentrations of organic materials in marine sediments to be increased above those which could degrade marine life.

    c. Nutrient materials in concentrations that would cause objectionable aquatic growths or degrade indigenous biota.

    d. Marine communities including vertebrate, invertebrate, and plant species to be degraded.

e. Alteration of natural taste, odor, and color of fish, shellfish or other marine resources used for human consumption.

In general, discharge from the Point Loma outfall has not been observed to violate these standards.

A summary of observed impacts follows:

1. Biomass stimulation and depression. Biostimulation of benthic biota continues to occur 1.6 to 3.2 km north and south of the diffuser, while within 0.8 km of the diffuser abundance and biomass are depressed (Mearns, et al., 1976).

2. Altered species composition. Major shifts in the predominance of benthic species as a response to the Point Loma outfall are documented by Orlob (1975), and SCCWRP (1973). Such shifts cannot be readily evaluated in terms of their effect on man or the local ecosystem due to inadequate knowledge of benthic ecology. The effects of other variables are difficult to separate from discharge impacts, particularly when the "control" sampling stations are possibly exposed to different factors and may themselves be exposed to pollution. Major faunal changes include large increases in the *Amphiodia/Parvilucina* ratio and increased abundance of the pelecypod *Axinopsida* (SCCWRP, 1973). Demersal fish trawl surveys showed a notable lack of schooling perciform fishes inshore for reasons unknown (see Voglin, 1975 and Appendix D for recent SCCWRP trawl survey information).

3. Bioaccumulation. Accumulation of substances to levels many times the concentration of ambient waters is a well-documented phenomenon for many organisms. To date, no data are available which indicate toxic effects to marine communities or man as a result of bioaccumulation. SCCWRP (1973) studies suggest that metals in contaminated sediments are for the most part unavailable to the biota. A 1971 SCCWRP survey of chlorinated hydrocarbons in whole soft tissues of *Mytilus edulis* showed levels of DDT (0.066 ppm wet weight) to be comparable to control stations, while the level of the PCB Arochlor 1254 was roughly ten times higher than control stations (SCCWRP, 1973). These levels do not exceed federal limits for human food, but may have subtle detrimental effects on the organisms.

4. Diseases. A number of anomalies have been noted in fish populations: fin erosion, tumors, exophthalmia, ambicoloration, structural deformities and parasites. These have been studied in some detail and are important not so much in terms of impact on fish populations, but as possible indicators of toxic elements in the environment (Sherwood and Mearns, 1974; Stich, et al., 1976). Of these diseases, only fin erosion appears to be directly related to wastewater discharges, and may be caused by contact with chlorinated hydrocarbons in sediments (Sherwood, 1976). Sampling of Dover sole (the fish species most affected by external anomalies) off Point Loma showed none of the 64 caught to have fin erosion, compared to 39 percent (5,594 individuals) with fin erosion on the Palos Verdes Shelf in 1972-1973 (Sherwood and Mearns, 1975). Similarly, none of the 64 Point Loma Dover sole had tumors, compared to 9 percent of Santa Monica Bay juvenile sole. Tumor-bearing Dover sole have been collected outside of southern California, in unpolluted areas. Thus, the relation of tumor incidence to wastewater discharge is unclear, although there is a trend towards increased frequency in polluted areas (Sherwood and Mearns, 1975). Mearns and Sherwood (1977), in a review of fish diseases relative to wastewater, concluded that:

> The consistency in the distributional pattern of tumor-bearing Dover sole (despite differences in the degree of contamination at the various outfall sites), the presence of tumor-bearing Dover sole in areas distant from waste discharges, and the low prevalence of the disease compared to that in species from the Pacific Northwest suggest that the disease is not related to the discharge of municipal wastes in southern California.

Matsudo and Chamberlain (1976) examined tumor-bearing Dover sole from near sewage outfalls in the Los Angeles area. All tumors (nine) were found to contain organisms believed to be mycoplasmas. Mycoplasmas have not been previously reported from fish or fish tumors; they have been isolated from human malignant tumors, but it is not clear whether they were the cause of the tumor or a secondary infection (Hayflick, 1972). One type of mycoplasma has been found in sewage, and it is possible that sewage discharges are the source of the organisms observed in Dover sole tumors.

> The other fish anomalies reported are far less frequent and do not presently appear to be directly related to wastewater discharge. No data for occurrence of these diseases in Point Loma fish populations were found.

Secondary treatment will not substantially alter mass emissions of nitrogen and phosphorus, which are major nutrients for phytoplankton growth.

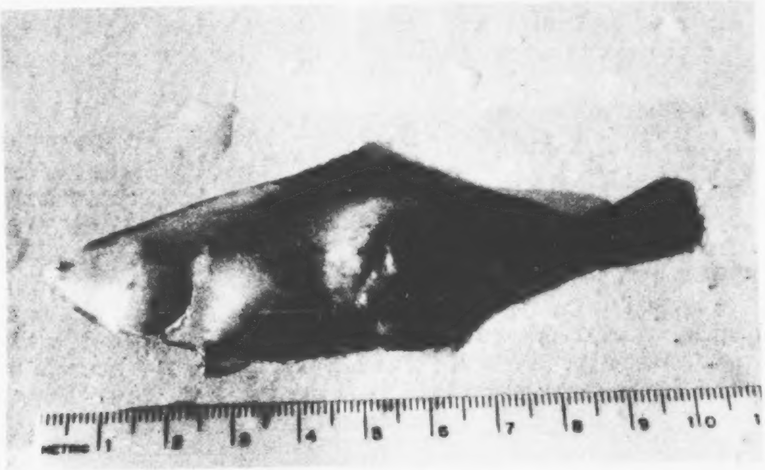
The influence of secondary effluent on marine phytoplankton was recently examined in a study conducted on the East Coast (Dunstan, 1975). Studies have shown that secondary treatment converts organic nitrogen and phosphorus into inorganic forms which are most readily used by phytoplankton. Nitrogen (N) generally occurs as ammonium (NH_4^+) while phosphorus (P) is present as orthophosphate (PO_4) but is highly variable depending on influent quality and treatment. All species of marine phytoplankton use and require N and P up to a point where other substances necessary for growth, either in the sewage or occurring naturally in seawater, become limiting. Such potentially limiting substances include trace metals, vitamins, silica, and other organic and inorganic compounds. Without wastewater inputs of nitrogen, the most common growth-limiting factor, such trace substances would not normally have a significant influence on phytoplankton growth (Ryther and Dunstan, 1971). Besides being growth limiting, some wastewater constituents can also be toxic to certain species and can influence phytoplankton production, distribution,and population dynamics.

Secondary treatment will reduce suspended solids concentrations, thus increasing light penetration and the amount of light available for photosynthesis.

Reductions in toxic constituents through effective source control and improved treatment will reduce the concentrations of toxic pollutants which can adversely affect marine phytoplankton. Reduced pollutant inputs, combined with the increased availability of nutrients (resulting from increased flows) and light should result in a net increase in marine phytoplankton productivity.

Secondary treatment will reduce the potential for adverse impacts on zooplankton which live in the offshore waters near the outfall. Existing effects are not known but PCB's are known to have acute effects on crustaceans at very low concentrations.

Fin erosion afflicts Dover sole and white croaker (shown above) living in the vicinity of ocean outfalls and areas of waste discharge.



LARGE EPIDERMAL PAPILLOMA ON A JUVENILE DOVER SOLE
Microstomus pacificus

These tumors are widespread and have not been correlated directly with wastewater outfalls but may be the result of ocean pollution by synthetic chemicals, or may be a natural phenomena.

The effect of the Point Loma outfall's discharge on adjacent kelp beds is difficult to evaluate, but is is probably minor, as suggested by two observations: 1) The severe decline in the Point Loma kelp bed began twenty years before discharge from Point Loma and began to be reversed at the same time discharge from the outfall commenced (1963). 2) Those areas once covered by kelp canopy which have failed to regenerate are farthest from the outfall and near to San Diego and Mission Bays. If increased turbidity and organic enrichment do contribute to the detriment of kelp beds by supporting dense sea urchin populations, then the reduction in turbidity and organic matter resulting from upgrading to secondary treatment will have beneficial effects on the area's kelp resources. In addition, any reduction in the discharge of settleable solids due to improved treatment would be beneficial to kelp in areas where siltation is sufficient to affect adult plants and the settling of spores. However, appreciable siltation has never been observed in the Point Loma kelp bed, either on the fronds or on the holdfasts of the plants. Wave surge and currents are apparently sufficient to prevent fine suspensoids from settling and sand which does exist in low pockets among the rocks is usually rather coarse (SWQCB, 1964).

Reduced organic inputs will decrease the potential for localized buildup of organic material which serves as food for invertebrates such as sea cucumbers, sea urchins, brittle stars, and other echinoderms near the outfall. Reduced pollutant inputs will reduce the potential for toxic effects on crabs, shrimp, and numerous other sensitive forms of marine life which inhabit the sea floor. The effects which the elevated sediment metals concentrations around the outfall may have on the benthic invertebrate community have not been determined. There is concern over the uptake of metals by invertebrates and other marine organisms. It is known that in some instances, incorporation of present environmental levels of DDT and PCB's into the food web could have adverse effects on larval and adult crustaceans. Improved treatment and source control will reduce such impacts.

Improved treatment will reduce the input of organic materials which directly and indirectly influence marine fishes in several ways. Fish are attracted to the outfall area because the outfall structure serves as a habitat for a variety of marine organisms, and because the general biomass of the area is increased by the organic material discharged through the outfall. Organisms whose response to the availability of organic input has been greatest include polychaete worms and other soft-bodied infauna, which form a critical part of the diet of many fish.

Though the biostimulatory effect of these nutrient inputs will be reduced by improved treatment, there will be several natural biostimulatory conditions which will compensate for the reduction. Decreased emissions of suspended particulates will allow greater phytoplankton productivity, an effect which will eventually stimulate production throughout the food web. This will be enhanced by the reduced concentration of toxic materials. Reduced toxic materials inputs will reduce the potential for adverse effects on fish due to biomagnification.

Reductions in suspended solids will minimize the potential for clogging gills. Reductions in BOD_5 (associated with SS) will reduce oxygen demand. The resulting increase in dissolved oxygen levels near the outfall should reduce the impact on sensitive fishes, and their eggs and larvae.

Effects on Incidence of Fish Disease. Improved treatment and effective source control will reduce the inputs of PCB's and other toxic pollutants which may be linked with fin erosion disease observed among fish living near ocean outfalls. By reducing emissions of suspended particulates and other food materials which attract and support fish populations, the populations will decrease and the potential for naturally occurring contagious diseases among these fish will be diminished as a result of decreased population density. General environmental conditions should improve which will enhance fish survival. Such improved conditions will result from reduced inputs of toxic pollutants and other potential stress factors.

The effect of improved treatment on tumor diseases cannot be estimated because a direct correlation between this disease and wastewater effluents has not been established. If tumors are induced by wastewater constituents either directly (carcinogens) or indirectly (adverse environmental conditions) then improved treatment will reduce disease incidence.

Improvements in effluent quality and reduced mass emissions of toxic wastewater constituents will also lessen the potential for diseases among other marine organisms. These include diseases which affect kelp, sea urchins, crabs, marine birds and mammals.

Microbiological Effects.

Bacterial and Virus Removal. Secondary treatment processes achieve greater removals of bacteria and viruses than primary processes. The average number of viruses in secondary effluents could average below 1 PFU* per liter, (200 times less than in primary effluents). The potential risk to public health will be reduced by a similar factor. Only limited data are available to determine specific differences in removal efficiencies between the various alternative secondary processes (e.g., Malina and Sagik, 1974).

It is known that activated sludge processes will remove 90-99 percent of the bacteria and viruses entering the process (Cooper, 1975).

Bacteriological Concentrations in the Marine Environment. Secondary treatment will reduce effluent total coliform MPN concentrations by a factor of 10^3 (1,000). Onshore bacteriological counts will be lowered due to the reduced numbers of bacteria in the water. Also, lower mass emissions of suspended and floatable solids will cause a more rapid bacterial die-off rate, since these solids often shield potential pathogens from sea water which normally kills them within a few hours.

Possible Impacts of Wastewater Discharged Near the Tia Juana River Area.

In general, biological and physical impacts of wastewater discharge off the mouth of the Tia Juana River will be similar to those for Point Loma, as discussed earlier. Relatively little is known of the biological and physical conditions of this area, in comparison with the Point Loma area. Consequently an evaluation of the impacts of wastewater discharge in the area is difficult except in general terms.

The current patterns in the region of proposed discharge are poorly known, and are clearly essential to proper selection of outfall location. Figure II-14 depicts littoral sediment transport paths, indicating the offshore zone of sediment deposition. If effluent from the southern outfall follows a similar pattern, a long residence time and accumulation near the mouth of San Diego Bay could militate against efforts made to improve the water quality of San Diego Bay. Current patterns in the vicinity of the proposed outfall are necessary to determine whether effluent will move northwards as part of the Silver Strand littoral cell.

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* PFU = Plaque Forming Unit.

VII. SECONDARY IMPACTS OF THE PROPOSED ALTERNATIVE FACILITIES PLANS

Wastewater Facilities and Their Role in Urban Development

The major role of the Facilities Plan project stems from its proposed increase of total treatment capacity from the present 115 mgd to 200 mgd by the year 2000. This increase in total treatment capacity (wastewater, sludge digestion, sludge disposal) would accommodate substantial population increases, irrespective of the level of treatment adopted. Splitting the system and building more than one treatment plant may cause some shift in the distribution of population, but this shift would not be significant when compared to the potential urban growth and population shifts within the region that will be encouraged (but not caused) by extending new services - including interceptor sewers - to peripheral communities and undeveloped lands.

The Facilities Plan project is a conceptual study and is a master plan for the year 2000 metropolitan sewerage system. As stated above, its major role is in (1) its proposed increase of the total treatment capacity to 200 mgd and (2) the development of alternative systems to achieve this expansion and arrive at an apparent best alternative for adoption. Because the backbone of the metropolitan system - its metropolitan interceptors and trunk lines - are already in place and were constructed to accommodate at least the 200 mgd, and the majority of the community interceptors are also constructed and designed to accommodate the capacities allocated to the various member agencies, the impact of the facilities plan on population growth, population distribution and urban sprawl and their related secondary impacts, primarily air pollution, is essentially the result of:

1. Increase of systems treatment capacity from 120 mgd to 200 mgd.
2. Availability of additional treatment capacity within the system for the City of San Diego, member agencies, and others that may be encouraged to request the services of the metropolitan system.
3. Splitting of the treatment plant, which would provide new plant(s) to areas that hitherto could not benefit from the system because of the costs of access and conveyance to treatment.

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It must be realized that the total population to be accommodated by the project remains the same irrespective of the system alternatives or the viable alternative to be adopted. Only the distribution of population could be affected, depending on where and when the extension of services, benefiting from the increased capacity of the project, takes place. It must also be realized that before implementation of any phase of the Facilities Plan or construction of any of the facilities, specific Environmental Impact Reports (EIR's) will be prepared, and that the decision-making bodies and the public will have the opportunity to act on each facility or phase of the master plan before its construction. Therefore, it is not the intent of this EIS at this time to detail the impact analysis of specific facilities, but rather to provide sufficient analysis and impact definition of the master plan for decision-makers to evaluate the overall scope and consequences of the facilities planned for land use and urbanization, with special attention to air quality.

Public Utilities and Population Growth in the San Diego Area

If no new utilities are provided by the public sector, population increases will tend to be absorbed within those areas which already have utilities. This will result in increased density and infilling within today's urbanized areas unless developers themselves pay the full cost of utility extension. Comparison of the 1975 and projected 1995 residential densities indicates the percentage increase in dwelling units per acre expected over the next 20 years.

Subregional Area	Percentage Increase in Dwelling Units Per Acre 1975 to 1995
Central San Diego	41%
Peninsula	25
Coronado	29
National City	30
South East San Diego	29
Mid City	29
Kearney Mesa	38
Coastal	22
University	120
Chula Vista	34
Spring Valley	22
Lemon Grove	47
La Mesa	30

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*Derived from CPO information and projections (see El Wardani, 1977, Figures 2.39 and 2.52.

The remaining subregional areas will encounter an infill of 3-15 percent except for Miramar, which shows a drop in density. The data used for the above analysis are taken from the Comprehensive Planning Organization RCP Series II forecast of gross residential density for the San Diego region.

Proposed public facilities such as the extension of new roads, water lines, and sewer lines must be identified and considered when examining population growth and determining whether it would take the form of urban sprawl as opposed to infill of existing urbanized areas. Figures VII-1 and VII-2 depict the areas which will be served by public sewerage systems and water, respectively. Examination of Figures VII-1 and VII-2 indicate that a number of the planned interceptors and water mains have the potential of opening up service to peripheral land areas which could affect the future urban form of San Diego.

One probable outcome of extending utilities is a reduction in the overall density of the urban area. Reduced density in turn means greater automobile use; first, because densities sufficient to support mass transit are not available, and second, because with lower density, commercial development is slow in moving into an area and people most drive further to satisfy their commercial needs. Consequently, any expansion of the urban area into new areas untill all existing urban areas are filled has the effect of increasing automobile use. This thesis is borne out by analyses of newly developing areas which show substantially greater automobile use than areawide averages.

Highways, water supply facilities and sewers are the three main elements of public investment which establish the urban infrastructure. A recent EPA research study, Secondary Impacts of Transportation and Wastewater Investments, showed that public investments in transportation and wastewater were very important in determining urban form, particularly at the urban fringe. In the cases examined, sewers played a more important role than highways. Consequently, the proposed facilities can be expected to substantially increase urbanization pressures in the areas served.

Transportation Systems. Many areas in San Diego are already experiencing urbanization pressures because of existing transportation systems. It is to be expected that all vacant land within a 30-minute travel radius of downtown San Diego is currently subject to some development pressure. Any new construction (Figures VII-3 and VII-4) of freeways, expressways, or major arterials in the service area can be

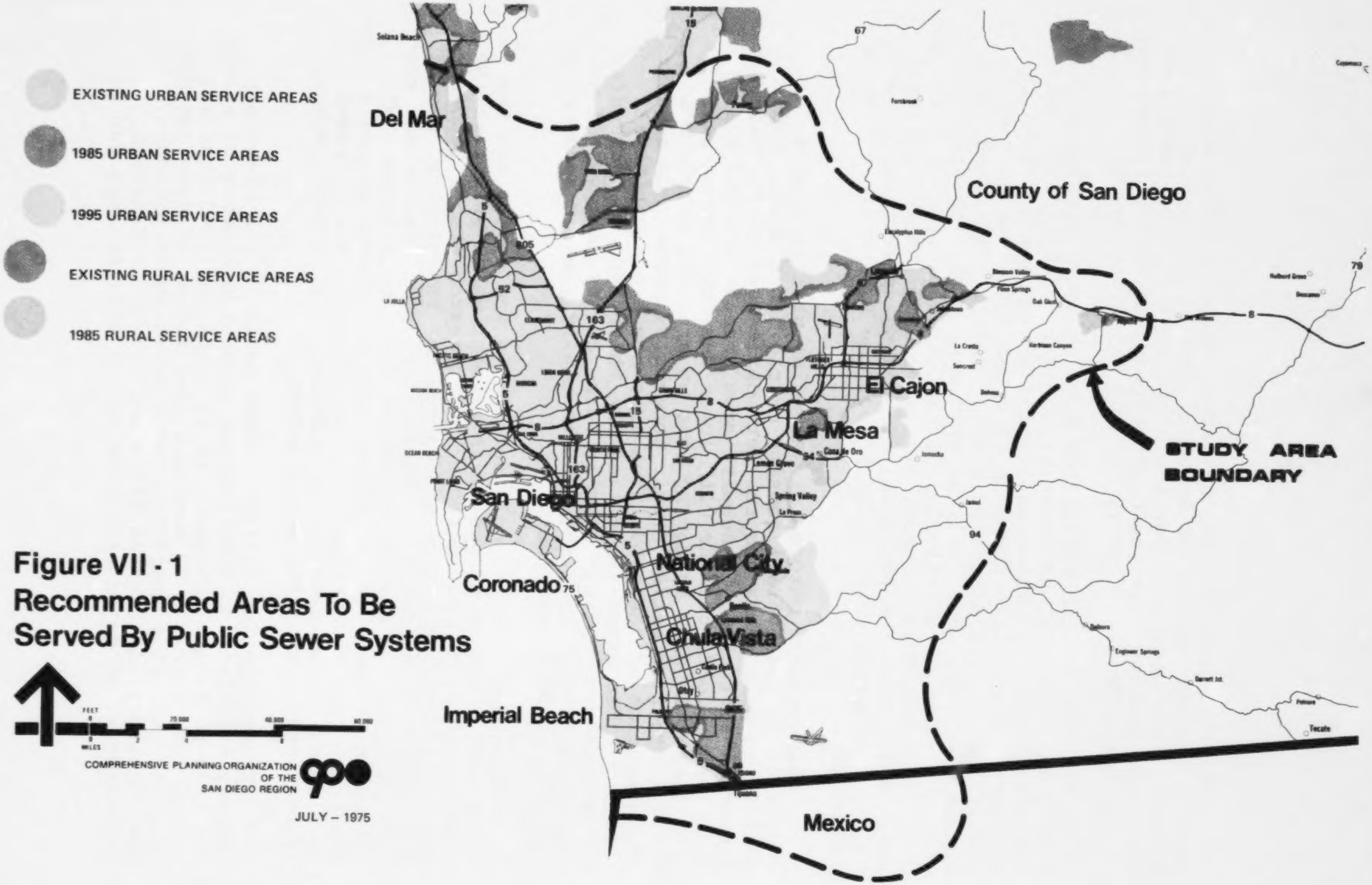

Figure VII - 1
Recommended Areas To Be
Served By Public Sewer Systems

COMPREHENSIVE PLANNING ORGANIZATION
OF THE
SAN DIEGO REGION

JULY – 1975

● EXISTING URBAN & RURAL AREAS SERVED (CWA)

● 1985 URBAN AREAS SERVED

● 1995 URBAN AREAS SERVED

● 1975 – 1995 RURAL RESIDENTIAL/AGRICULTURAL AREAS SERVED

● GROUNDWATER RESOURCE AREAS SUITABLE FOR DOMESTIC AND AGRICULTURAL USE OUTSIDE THE CWA BOUNDARY

SAN DIEGO COUNTY WATER AUTHORITY (CWA)

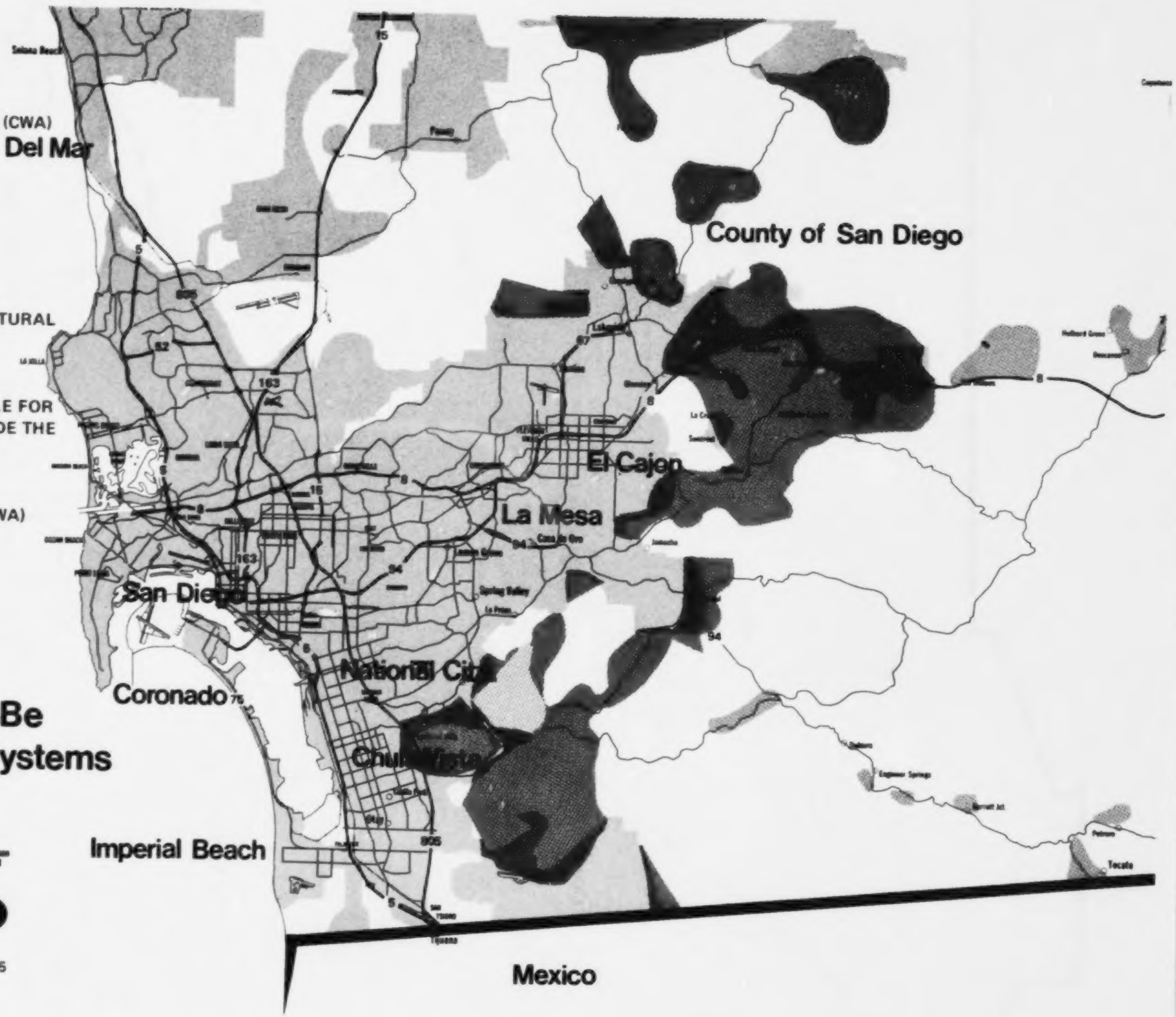

Figure VII - 2
Recommended Areas To Be Served By Public Water Systems

FEET 0 20,000 40,000 60,000
MILES 0 2 4 8

COMPREHENSIVE PLANNING ORGANIZATION
OF THE
SAN DIEGO REGION
CPO

JULY – 1975

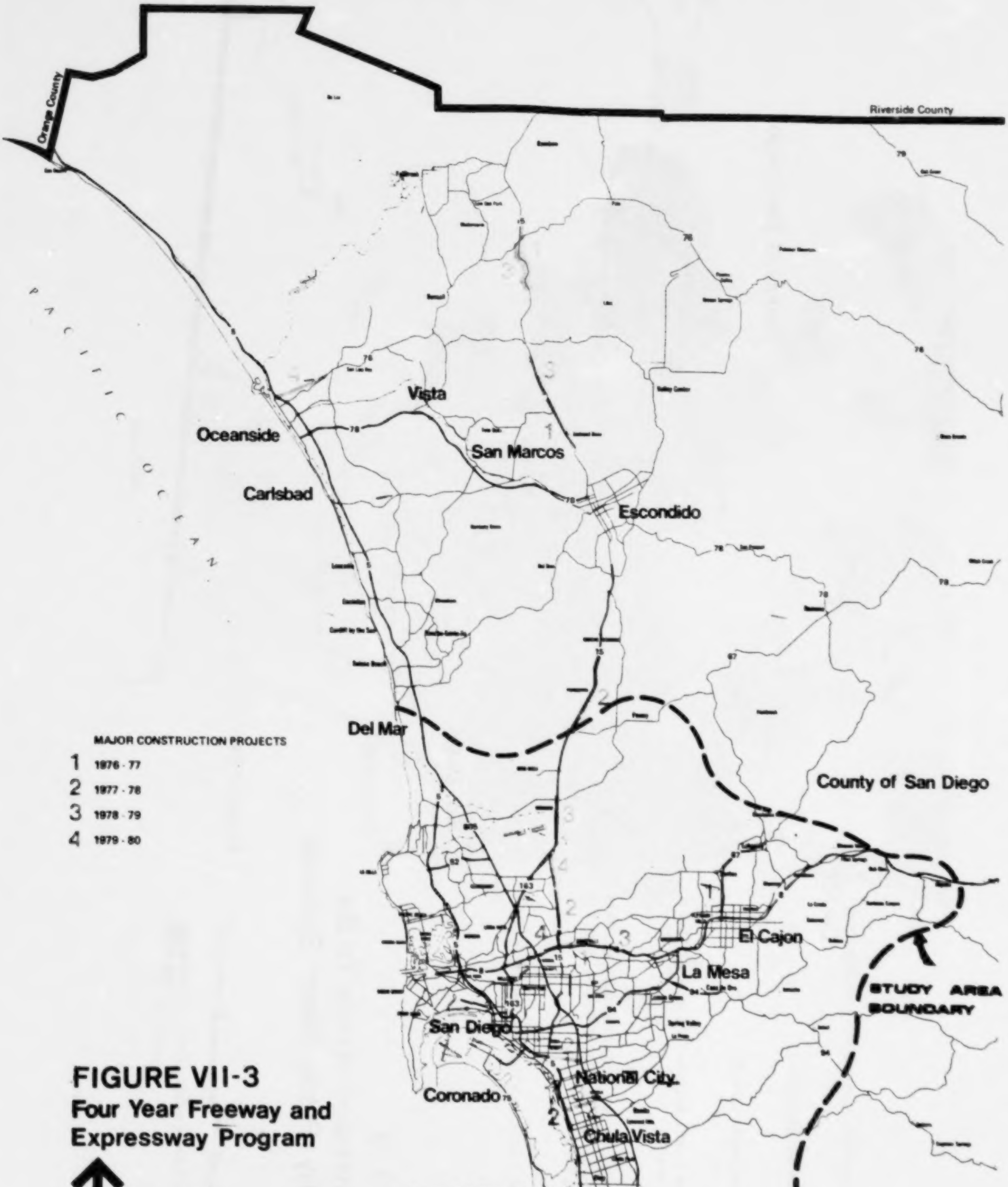

FIGURE VII-3
Four Year Freeway and Expressway Program

COMPREHENSIVE PLANNING ORGANIZATION OF THE SAN DIEGO REGION
JANUARY 1976

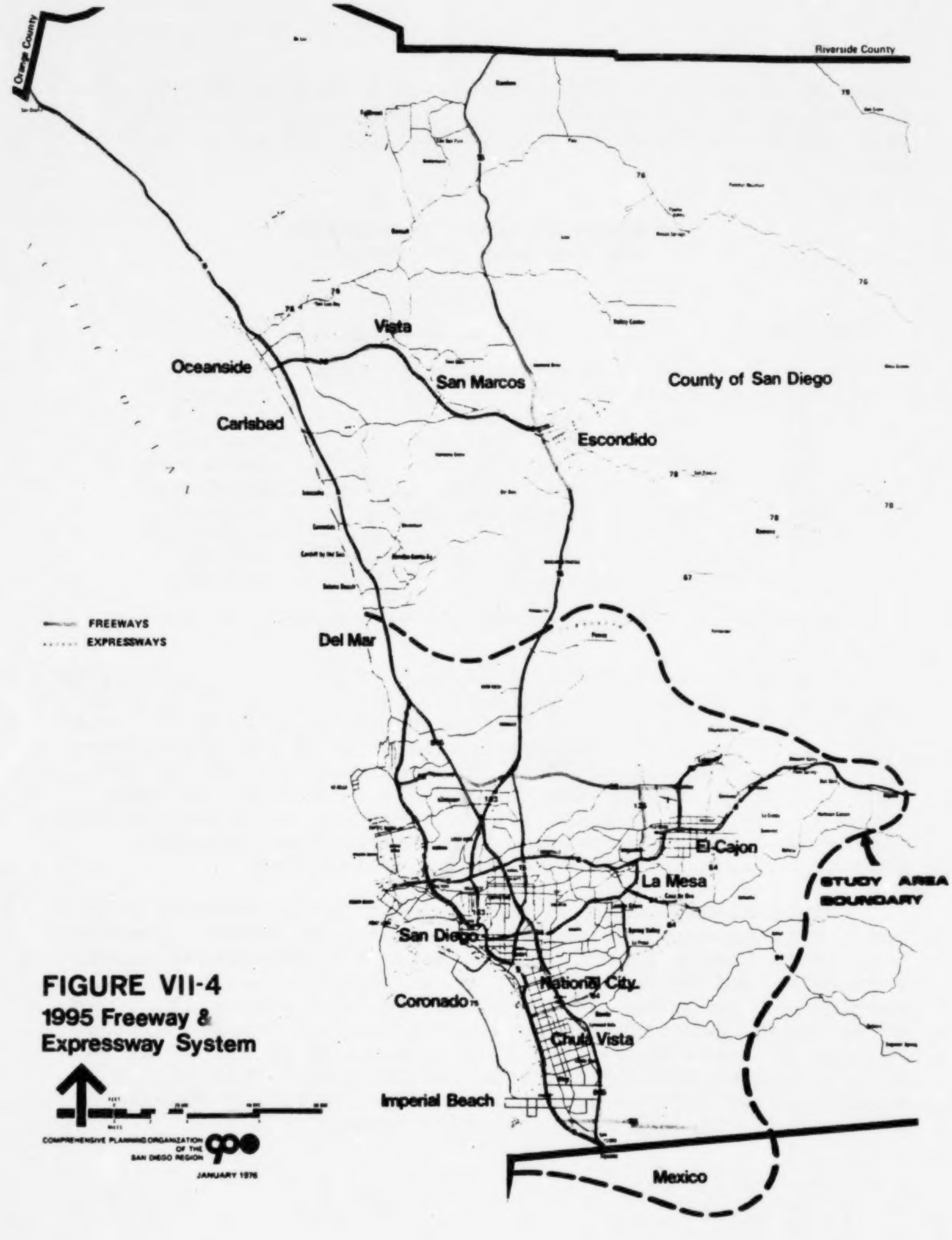

FIGURE VII-4
1995 Freeway & Expressway System

COMPREHENSIVE PLANNING ORGANIZATION OF THE SAN DIEGO REGION
JANUARY 1976

expected to increase this travel radius, increasing the area subject to development pressure. New highway construction proposed for the service area in the next ten years is shown below.

PROPOSED HIGHWAY CONSTRUCTION
FOR THE NEXT TEN YEARS

Route	Limits	Facility
15	I-5 to Riverside County Line	Freeway
52	I-805 to I-15	Freeway
52	I-15 to Route 67	Freeway
54	I-5 to Route 125	Freeway
54	Route 125 to I-8	Expressway
56	I-15 to Poway Road	Expressway
75	Border Crossing to I-5	Expressway
76	I-5 to Melrose	Expressway
94	Avocado to Jamacha Junction	Freeway
125	I-8 to Route 52	Freeway

Some of these roads will be very important in opening up new areas to development pressures. State Route 54 between I-805 and I-5 is scheduled for construction in 1976-77. This route will increase development pressures in the Sweetwater River Valley between National City and Chula Vista, in the Paradise Hills area of the City of San Diego, and in other areas in the river valley. These areas are experiencing some development pressure now, and have moderate access, but greater development pressure can be anticipated.

Right-of-way purchase for State Route 125 between I-15 and I-8 is expected to begin in the next few years. Construction is further off, but the purchase of right-of-way should stimulate land speculation and thus increase land prices and development pressures in the unincorporated county area north of El Cajon, particularly in the vicinity of Poway. Another portion of State Route (SR) 125, between SR 54 and SR 94 is also scheduled for construction fairly soon. This will significantly improve access in the Spring Valley/Sunnyside/ Otay Mesa/Bonita and Paradise Hills area.

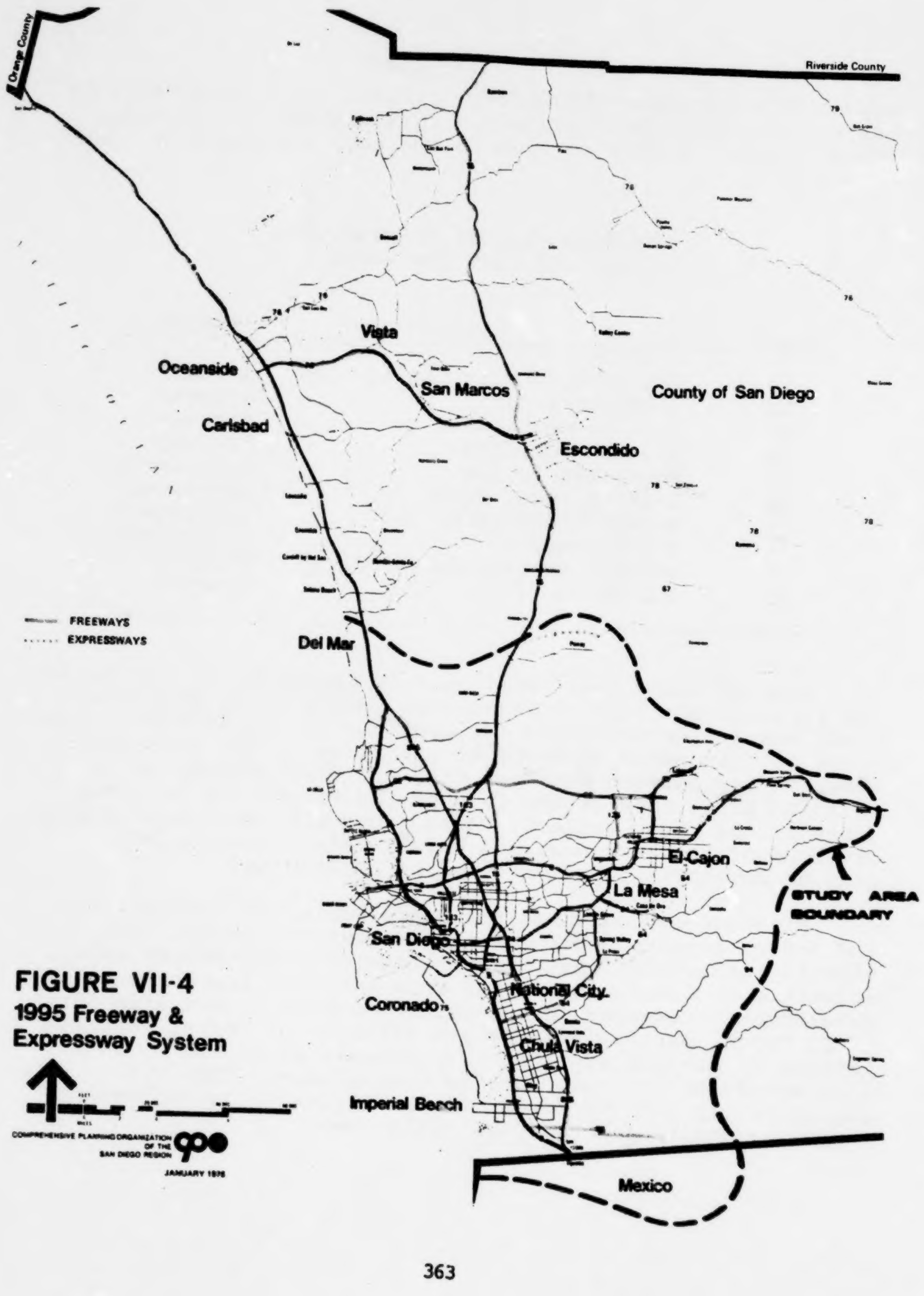

FIGURE VII-4
1995 Freeway & Expressway System

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FOR THE NEXT TEN YEARS

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54	I-5 to Route 125	Freeway
54	Route 125 to I-8	Expressway
56	I-15 to Poway Road	Expressway
75	Border Crossing to I-5	Expressway
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Right-of-way purchase for SR 52 between I-805 and I-15 in the North City is scheduled fairly soon. Although construction is not scheduled until after 1985, purchasing right-of-way will increase land speculation and development pressure in the North City, particularly in the area just south of Camp Elliott. This new road link is important because there is no access to the area at the present time.

Additional work is scheduled on Jamacha Road (SR 54) in El Cajon, on SR 94 east of the current freeway, and on SR 54 between Sweetwater Road and Jamacha Road. This construction should substantially increase development pressures in the unincorporated area south of La Mesa and El Cajon. Some development has started already, but the area is sparsely developed at the present time.

SR 163 is scheduled for widening between Clairemont Mesa Boulevard and I-15 in 1976-77. This construction should increase development pressures in the North City and on Clairemont Mesa.

Interstate 15 is scheduled for completion between San Diego and Escondido. This construction will intensify development pressures on Camp Elliott lands, but access is already provided by an expressway. Thus, substantial pressure already exists and development has already begun. I-15 will probably have more of an effect north of the service area, in the vicinity of Escondido.

SR 75 is scheduled for construction in the next ten years. This road will substantially improve access to Otay Mesa and can be expected to significantly increase urbanization pressures. Since the road would provide access to Brown Field, construction of the road is probably contingent upon Brown Field being upgraded for metropolitan use.

Some of the city streets scheduled for construction will also have a major role in shaping the urban form. Convoy Street between SR 52 and Balboa is scheduled for construction in the next ten years. This will open up part of the Clairemont for development.

Two other major new roads are scheduled for construction in the next five years. Mast Boulevard will be a new arterial in the Santee area of the county, increasing urbanization pressures in that area. Jackson Drive is to be constructed between Navajo and Mission Gorge, improving access in that partially developed area. Many other city roads are scheduled for improvement in areas which already have some access. Balboa will be upgraded near Montgomery Field, improving access to that area. Mira Mesa Road will be extended north of Miramar Naval Air Station; some access currently exists, but this will be a substantial improvement. Rancho Penasquitos Boulevard, Carmel Mountain Road, and Sorrento Valley Road will all be upgraded, improving access in the northern part of the city. Tierrasanta will be lengthened, improving access in the area south of Camp Elliott. Extensive work will be done in the Spring Valley/La Presa area, Jamacha Road, Sweetwater Road, and 69th Street. These improvements could increase the eastward trend of urbanization and result in increased densities in the partially developed areas along the Sweetwater River and reservoir.

Sewer Facilities. Various interceptor sewers are scheduled for construction in the next 20 years. These interceptor sewers were analyzed to determine which of these lines would encourage urbanization in areas not now served by utilities. These interceptors are identified and presented in Tables VII-1 and VII-2. In analyzing these proposed new facilities, it was determined that several of the facilities will open up new areas for urbanization in the next few years.

The City of San Diego is planning several new interceptors in the northern part of the city to serve new urban areas. The Kearny Mesa trunk sewer will allow additional urbanization to Kearny Mesa. The line is not critical however, since the area is already served by a 15-inch line. Further urbanization depends on this line, but urbanization can continue until 1977 without the line.

The city also plans some Rancho Bernardo system extensions. These facilities will encourage urbanization in areas of Rancho Bernardo which are now vacant. Murphy Canyon Interceptor Improvement is also planned by the city for 1978. This interceptor will serve vacant land south of Camp Elliott. Like the Kearny Mesa sewer, this line is not critical as the area is already served by an existing 30-inch line, the Tierrasanta sewer. Urbanization will not be affected by the need for new interceptor capacity until about 1978.

The city is planning a series of projects in the Rose Canyon area; a trunk sewer, an interceptor, and a reclamation plant are scheduled for construction sometime after 1980. This area currently has some sewer capacity that is available for use, however, the interceptor sewers will extend the area which can urbanize to the north of University City.

View of Mira Mesa development from I-15.

New houses nearing completion in the Tia Juana River Valley area.

Table VII-1

PROPOSED CITY OF SAN DIEGO COMMUNITY INTERCEPTORS AND TRUNK SYSTEM

Sewer No.	Name	Pipe size inches	Capacity MGD	Agency	Estimated Construction Year
149	Encanto I Interceptor	24-15	10	City of San Diego	1975
253	Lakeside Interceptor	39-33-27	9	Lakeside S.D.	1975
254	North Island Interceptor	39	11.7	City of Coronado	1975
255	Santee Interceptor	14 & 16 parallel	3.3	Santee CWD	1975
153	Tecolote Canyon Trunk	24-15	8	City of San Diego	1976
157	Kearny Mesa II Trunk	30-24	7.1	City of San Diego	1976
158	Fairmont Ave. Trunk	36-18	4.5	City of San Diego	1976
159	Chollas Valley Interceptor	60-36	50	City of San Diego	1976
160	Encanto II Interceptor	27-24	20	City of San Diego	1976
161	Montgomery-Palisades Trunk	21-8	6.6	City of San Diego	1976
154	Ocean Beach Trunk	27 Est.	Unknown	City of San Diego	1978
174	Kearney Mesa Trunk	Unknown	Unknown	City of San Diego	1978
152	Rose Canyon Interceptor	36 Est.	Unknown	City of San Diego	1979
156	Pacific Highway Trunk	60 Est.	Unknown	City of San Diego	1980
250	Rice Canyon Trunk	18-15 Est.	4	City of Chula Vista	1980
251	Otay Interceptor (North)	Unknown	Unknown	Spring Valley S.D.	1980
252	Otay Interceptor (South)	24 Est.	4	Otay MWD	1980
162	E. Mission Bay Interceptor	60 Est.	Unknown	City of San Diego	1981
163	N. Mission Valley Interceptor	60 Est.	Unknown	City of San Diego	1985
164	S. Mission Valley Trunk	66 Est.	Unknown	City of San Diego	1985
165	Harbor Drive Trunk	60 Est.	Unknown	City of San Diego	1985
166	Morena Blvd. Trunk	30 Est.	Unknown	City of San Diego	1990
167	Brown Field Interceptor	24 Est.	Unknown	City of San Diego	1990
168	Second North Interceptor	60 Est.	55	City of San Diego	1995
150	Gonzales Canyon Trunk	18-15 Est.	Unknown	City of San Diego	Unknown
151	El Camino Real Trunk	18 Est.	Unknown	City of San Diego	Unknown
155	E. Mission Gorge Interceptor	42-36 Est.	Unknown	City of San Diego	Unknown
169	Second 114" Interceptor	114 Est.	360	City of San Diego	Unknown
170	Second 108" Interceptor	108 Est.	190	City of San Diego	Unknown
171	Palm City Trunk	24 Est.	Unknown	City of San Diego	Unknown
172	Sunset Cliffs Trunk	24 Est.	5	City of San Diego	Unknown
173	Commercial Ave. Trunk	21 Est.	Unknown	City of San Diego	Unknown
FM-5	Gonzales	16 Est.	-	City of San Diego	Unknown

Source: CPO Water Resources Plan, Comprehensive Plan, San Diego Region, 1975.

Table VII-2

PROPOSED FUTURE IMPROVEMENTS -- MEMBER AGENCIES

Agency Agency	Facility	Preliminary Cost In Dollars	Estimate Construction Year
Otay M.W.D.	24"/27" Jamacha Basin Interceptor Sewer and Water Reclamation Project	11,500,000	Unknown
	Construct Collector Sewer System and Interceptor. (Shadow Hills are Proposed Improvement Dist. No. 21)	2,120,000	Unknown
	Sweetwater Springs Interceptor	405,000	Unknown
	Interceptor System Extensions in Jamacha Junction Vicinity	2,025,000	Unknown
	Treatment Reclamation Plant, Interceptor and Trunk Sewers, Otay Mesa-Improvement District No. 15	2,500,000	Unknown
Spring Valley C.S.D.	Expanded La Presa Trunk Sewer-Phase I	137,000	1975
	Construct Casa de Oro Trunk Sewer - Phase II	100,000	1975
	Expanded La Presa Trunk Sewer - Phase II	319,000	Unknown
	Construct Interceptor Extension Along Sweetwater Lake	2,500,000	Unknown
La Mesa, City of	Miscellaneous Main Replacements	640,000	1976
	Alvarado Canyon Interceptor, Phase I	150,000	1977
	Construct University Interceptor Sewer	40,000	1977
Pomerado C.W.D.	Provision for 2 MGD Additional Capacity in Metro System	650,000	Unknown
	Midland-Espola Road Interceptor, Pomerado Road Interceptor	530,000	Unknown

Source: CPO Water Resources Plan, Comprehensive Plan, San Diego Region, 1975.

The City of San Diego also proposes to construct the Brown Field interceptor within the next few years. This interceptor sewer will parallel the proposed SR 75 and will open up areas of the Otay Mesa not currently served by interceptor sewers. Since some access is already provided in the area, the lack of interceptor sewers appears to be the major factor preventing urbanization. Extension of this line will be critical in the urbanization of the Otay Mesa.

The Spring Valley County Sanitation District plans to construct two new interceptors in the next five years which will open up new areas not now served by sewers. The La Presa trunk sewer will extend into vacant land above La Presa as of 1976 and encourage urbanization of that land. The area currently has moderate access, and will have better access with the construction of SR 54. The Sanitation District also intends to construct the Casa de Oro trunk sewer. This sewer will open up urbanization in the area between Jamacha Road and SR 94 just west of Jamacha Junction. The area has moderate access and can be expected to begin developing if interceptor service is provided. The district also has plans to construct an interceptor extension along Sweetwater Lake sometime after 1986. At that time, the interceptor will be expected to increase urbanization pressures in the area between La Presa and Spring Valley.

The Otay Municipal Water District also plans to construct some new interceptor sewers which will tend to encourage urban development. The most critical of these lines is the Jamacha Basin interceptor sewer and Water Reclamation Project. This eleven and a half million dollar project will provide service for the Rancho San Diego development. The line will parallel the route of SR 54 and Jamacha Road. The area has moderate access, and will have improved access if SR 54 and Jamacha Road are upgraded. Very little urbanization has taken place thus far, but urbanization would certainly be encouraged by provision of interceptor sewer service. Three other lines are also planned, but the amount of development probably depends more on provision of access than sewer lines. One line would serve the Shadow Hill Area Improvement District No. 21 above Jamacha Road in Jamul; another, the Sweetwater Springs Interceptor would serve Campo Highway east of Jamacha Junction; and the third, various interceptor system extensions in the Jamacha Junction Vicinity, would serve the area east of Jamacha Junction and north of Willow Glen. All of these areas are currently poorly served by arterial highways and freeways, and are subject to less urbanization pressure than many other areas. The Otay Municipal Water District also plans a treatment plant, interceptor and trunk sewers in Otay Mesa Improvement District No. 15. At present, the status of this project is uncertain, since there is ongoing debate about the transition of agricultural land to urban uses.

Pomerado County Water District is planning two projects which will have a major role in increasing urbanization pressures in the Poway area. In addition to the current request for increased capacity allocation in the metropolitan system of 2 mgd for a total of 4 mgd, the district plans to construct the Pomerado Road Interceptor and the Midland-Espola Road Interceptor. Both of these lines will provide sewer service in areas where no service is currently available and the additional capacity requested will accommodate significant expansion of growth in Poway which is indeed a peripheral growth leading to definite urban sprawl of the metropolitan area.

Water Facilities. A number of water resources projects are planned for completion by 1995. These facilities are intended to correct existing problems and deficiencies and to meet the needs of the region and the areas to be serviced by 1995. The water facilities proposed are listed in the July 1975 Water Resources Plan by CPO, Volume 6 of the Comprehensive Plan for the San Diego Region. The planned facilities which are most likely to contribute to urbanization are briefly discussed here.

The City of San Diego plans to build a $3,000,000, 54-inch line from Santo Road to I-805, referred to as "Clairemont Mesa Boulevard cross-tie pipeline". The project would correct water transmission deficiencies to the Clairemont Mesa and beach areas. The city also plans to upgrade the water system for the south bay area, contingent upon future growth in the Otay Mesa area. The upgrading involves a planned reservoir (formerly San Ysidro Reservoir) in the border area terminal.

The Otay Metropolitan Water District has a number of water projects planned, including (1) Improvement District No. 23 involving storage tank, pumping facilities, and distribution system to extend services to a new improvement district, and which could include Singing Hills Golf Course and a small area within existing Irrigation District No. 3, (2) a $5,000,000 project to provide storage and transmission in a 3,140-acre area known as El Rancho Del Rey. This project involves transmission lines, a 7.5 mg aqueduct connection, and five storage reservoirs, (3) a $22,000,000 aqueduct connection with water storage, transmission and pumping to serve a planned residential development of approximately 6,500 acres in the Rancho San Diego Area-Improvement District No. 20-Jamacha Basin, and (4) the Practor Valley trunk, a $7,000,000 project to service the agricultural needs of the Otay Ranch which is presumably not intended for urban services.

The Rio San Diego Municipal Water District has a number of water facilities including (1) a $15,000,000, 6,900-foot, 36-inch transmission main from Helix Irrigation District to El Monte Pump Station for lift and supply of water to the El Monte Basin and Blossom Valley, (2) a number of improvements for interconnection fo Helix Water District, (3) a filtered water system improvements supply line to Lakeside Irrigation District, and (4) a project for a 3-15 million gallon reservoirs to provide storage for filtered water when the district accepts delivery of State Project water. Construction of the above facilities will begin this year and the required Environmental Impact Reports have been prepared. The Helix Water District has plans for additional transmission main capacity, the Pepper Drive Pipeline by 1981, and a pump station in Grossmont for the additional capacity needed. Both projects are estimated to cost about $1,000,000, and are for filtered water.

Helix Irrigation District has sufficient raw water supply capacity to meet its needs to ultimate development. However, Rio San Diego Municipal Water District must provide an additional 18 mgd to meet 1990 needs and 22 mgd to satisfy their ultimate requirements.

The proposed transmission, storage, and treatment facilities are primarily for changing over from raw water to filtered water and to provide the 1990 filtered water needs for both Helix Irrigation District and Rio San Diego Municipal Water District. Santee and Lakeside are within the Rio San Diego General Water District, while Alpine is within the Rio San Diego Municipal Water District Improvement District I. The filtered water distribution system is constructed and is adequate for anticipated 1990 needed water service to the Santee/Lakeside and Alpine communities. Road access to the area is adequate and it appears that once the water improvement projects are constructed, the critical and limiting factors to new urbanization in this area will be the sewer facilities, primarily the provision for additional capacity (approximately 2-3 mgd) in the metropolitan sewerage system. In all probability the county will ask the City of San Diego for this capacity revision.

The San Diego County Water Authority plans a $6,000,000 pipeline for extension from Shepherd Canyon to Alvarado treatment. The pipeline is required to convey raw blended water to Alvarado Plant and Pipeline 3 to be converted to filtered water pipeline. Another 72-inch pipeline to parallel existing line under I-15 for 1.15 miles is needed for additional capacity for Miramar Treatment Plant.

Most of the above proposed facilities are more than adequate to meet water needs. This is probably due to the practice of preparing engineering specifications to handle growth for a period of 40 years or more. The facilities proposed would contribute to urbanization as previously discussed but would not be solely or primarily responsible for the urbanization. It is essential that each facility be reviewed and updated to take into account changes in land use. Also, before implementation of proposed facilities, an Environmental Impact Report must be prepared to analyze the specific impacts of each and every project.

Water Reclamation/recycling. As was discussed earlier in this report under "Water Supply" and in other sections, the use of treated wastewater may supplement the potable water supply in the San Diego area. Such reclaimed water can be looked upon as: 1) replacement water reducing the amount of imported water; 2) new water supply supplementing the existing supplies (local and imported). Replacement water will not serve growth, but additional supplies will certainly be available for new customers.

Reclaiming wastewater for use in landscape irrigation, agricultural irrigation, industrial cooling waters, etc., will make the existing potable water from such uses available for residential and commercial use. Recycling of domestic wastewater back into the water supply system will greatly increase the potable residential and commercial supply. At the present time the costs of adequately treating reclaimed/recycled water exceed the costs of imported water. Use of reclaimed/recycled water depends on technological, political, health and monetary considerations. When these considerations become favorable towards reclaiming/recycling water, such a program may become a major implementing factor in growth in the San Diego area.

Urbanization Impacts

The proposed increase in systems capacity from 120 mgd to 200 mgd will accommodate an additional population of about 900,000 by the year 2000. Unless land use planning restricts development of the peripheral lands, an important portion of this population will be attracted to the suburbs, and thereby cause a spectrum of urbanization impacts.

Initially, no restriction was placed on the amount of capacity for which any individual participant wished to contract in the metropolitan sewerage system. More recently, however, the City has viewed applications for participation in terms of potential land problems in unincorporated urban areas (e.g., Santee/Lakeside and Pomerado-Poway). It can be seen from Table VII-3 that most contracting members in whose service areas fringe urbanization would occur have capacity in excess of their current needs. For example, the contracted capacity in Chula Vista is 22.10 mgd. The average daily flow of 5.009 served a 1975 population of 73,100. Based on the present contracted capacity of 22 mgd and a generous per capita use of 100 gallons per day, the Chula Vista system can serve a potential population of approximately 220,000 persons. If future needs to conserve water result in reduced per capita use, an even greater population could be served with the same capacity. Conversely, Santee's contracted capacity of 2.76 mgd, which serves a population of 33,959, is exceeded by its use of 3.645 mgd.

The CPO Series II population projections for the City of San Diego anticipate a population increase of approximately 500,000 people between 1975 and 1995, for a total population of 1,270,000. The Series IV projections anticipate an increase of about 278,000 from 772,900 in 1975 to 1,050,700 in 1995. In either case, the future population of the city will require almost the entire available capacity of the present system. Therefore, unless the present system is expanded to handle 200 mgd, the growth projected for communities served by the Metropolitan Sewer System may have to get its needed capacity from that required for the City of San Diego's future growth.

It is important at this time to point out that the City of San Diego is committed by legal wastewater contracts to provide services to the member communities and agencies commensurate with capacities contracted, as shown in Table VII-3. The contracted capacities amount to 73.83 mgd excluding the city's own capacity of 166.17, for a total of 240.00 mgd. Current treatment capacity is 120 mgd and the facilities plan projects an ultimate capacity of 200 mgd.

There are no legal provisions for reallocating capacity within the system or for time phasing of contracted capacities to member agencies. In all probability, the difference in the ultimate capacity between 240 and 200 mgd will have to be absorbed by the City of San Diego, which currently contributes about 72 mgd (including Tijuana) of the average daily flow. The legal implications of the existing wastewater contracts are being studied by the city's legal department.

Table VII-3

Contracted Capacities and 1975 Flows of Member Agencies Critical to Urbanization

Agency	Year Connected	Capacity Contracted MGD	1975[1] Average Daily Flow MGD
City of Coronado	1964	3.00	3.131
City of Chula Vista	1963	22.10	5.009
City of Del Mar	1974	1.60	0.277
City of El Cajon	1963	10.00	6.676
Lakeside Sanitation District	1975	1.67	2.009
City of La Mesa	1963	6.00	3.978
City of Imperial Beach	1963	3.50	2.792
Lemon Grove Sanitation District	1963	2.80	1.598
Montgomery Sanitation District	1964	4.00	2.244
City of National City	1963	8.10	3.485
Pomerado County Water District	1972	2.00	1.846
Rolando Sanitation District	1963	0.30	0.173
Santee County Water District	1975	2.76	3.645
Spring Valley Sanitation District	1963	6.00	5.039
City of San Diego	1963	166.17	71.243
		240.0	113.145

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[1] See Table V-1 for 1977 flows.

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan, Environmental Impact Report, January 1977.

The Federal Water Pollution Control Act of 1972 required secondary treatment of sewage by July 1977, and treatment utilizing the best available technology by 1983. The Facilities Plan suggests ways in which these standards should be confronted. The Facilities Plan is also related to the 208 Plan Study now being conducted by CPO. The 208 Plan will investigate water quality problems in the region and propose solutions that will emphasize land use control and regulation rather than pipeline and treatment plant needs and questions. Until these programs can be resolved, the capacity of the Point Loma Treatment Plant could be limited to approximately 130 mgd, a capacity which will only support a population of about 1.32 million. Although the treatment plant is presently rated at 120 mgd, its capacity can be increased by addition of chemicals. The procedure could increase capacity to 130 mgd. Permission of the California Regional Water Quality Control Board, San Diego Region, is required.

San Diego City Council Policy 400-8, December 1970, addresses the subject of additional participating agencies being added to the metropolitan sewerage system. That policy states: "It is the policy of the City Council that capacity rights and access to the San Diego Metropolitan Sewerage System shall be limited to:

> Incorporated cities.
>
> Sanitation districts already contracting with the City on the dates of this policy, with no increase of capacity rights beyond that existing by contract.
>
> Other public agencies or expanded sanitation districts, provided that the proposed capacity rights and access in these cases is approved by the City Council(s) of the city or cities whose sphere of influence includes any portion of the area of the public agency applying for new or expanded service."

Land Use and Population Impacts

This section will concentrate primarily on impacts resulting from newly developing areas peripheral to the metropolitan study area and receiving future sewer and water facilities as identified in the July 1975 CPO Water Resources Program of the Regional Comprehensive Plan. These areas are depicted in Figure VII-5.

The several facilities proposed will play a critical part in increasing the urbanized area of San Diego. Since most of the service area already has excellent transportation access, sewer interceptor extensions will be of critical importance in encouraging further urbanization. The projects which appear of most significance in opening up new areas are the Brown Field interceptor, the Casa de Oro trunk, the Jamacha

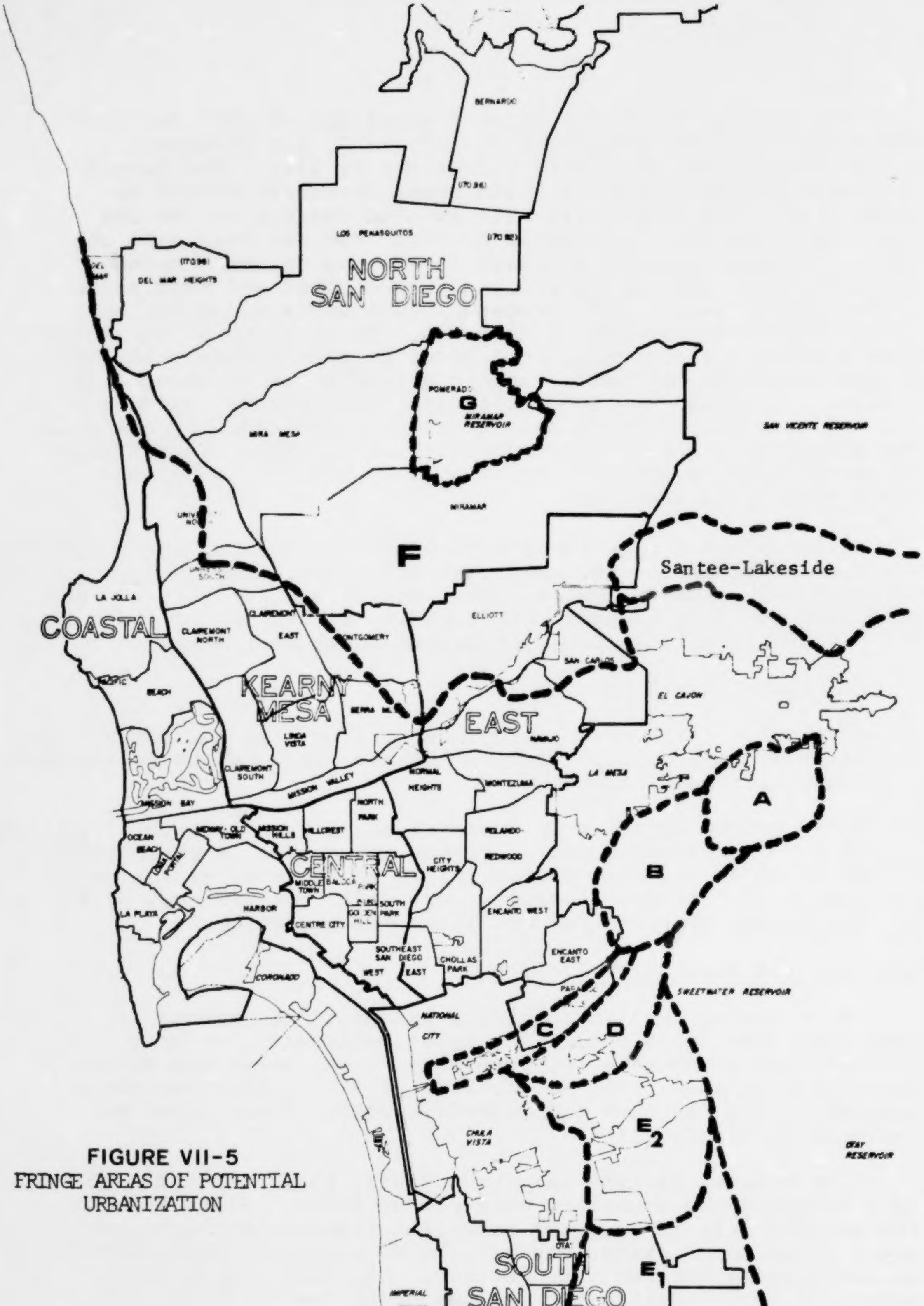

FIGURE VII-5
FRINGE AREAS OF POTENTIAL URBANIZATION

Basin interceptor sewer, the La Presa trunk sewer, the Midland-Espola Road interceptor, the Pomerado Road interceptor, the Rancho Bernardo System extensions, and the Spring Valley Community Sewer District interceptor along Sweetwater Lake. All of these projects extend sewer service into undeveloped land. In all of these cases, the extension of sewer service will encourage urbanization at these urban fringe areas.

The Study Area. The expected trend of land use development in the study area was discussed in Chapter III. The CPO preliminary Series IV projections anticipate the development of 69,300 acres in the area between 1975 and 1995, for an annual average of 3,465 acres. This amount and rate compares to the Existing Trends and Regional Comprehensive Plan (RCP) projections as shown below:

Source	Total Acres 1975-1995	Average Annual Change
Preliminary Series IV	69,300	3,465
RCP	81,900	3,723
Existing Trend	137,700	6,259

At the time this report is written, only preliminary and aggregate data from Series IV are available. Therefore, Series II contains the best information that can be used in this section at this time.

As shown above, the amount of land to be developed assuming that Existing Trends prevail averages 6,259 acres per year for a total of 137,700. If the Regional Comprehensive Plan governs, land will develop at an average annual rate of 3,723 acres for a total of 81,900 acres. Existing trends represent an increase of land urbanization of 85.7% compared to 51% for RCP. The pressure for development of agricultural, recreational and flood plain lands is estimated in Tables VII-4 and VII-5.

Induced urbanization will also cause a significant increase in runoff from the impervious surfaces of roads, structures and parking facilities. This increased runoff could contribute to the degradation of surface and groundwaters which may receive the runoff. Estimates of the runoff from induced urbanization must be evaluated and the specific impacts and mitigation measures assessed before the proposed facilities are implemented.

TABLE VII-4

Pressure for Development of Recreational and Flood Plains Lands

	RECREATIONAL		FLOOD PLAINS				
	1975	1995	Constrained in Flood Plains		Total Acres Available for Development 1975	Total Acres Developed from 1975-1995	% of Available Acres Developed
	Existing	Needed	Acres	% Area			
Total Region	23,157	36,440	35,087	3.1	87,969	70,065	80
Total Incorpoated Area	18,476	28,680	17,141	4.8	55,386	41,618	75
Total Unincorporated Area	4,681	7,760	17,946	2.3	32,583	28,447	87
Chula Vista	1,211	1,820	889	5.0	2,122	1,935	91
Coronado	303	382	0	0.0	0	0	0
Del Mar	65	73	173	16.2	139	139	100
El Cajon	984	1,325	0	0.0	0	0	0
Imperial Beach	374	380	833,883	29.2	53	53	100
La Mesa	744	763	0	0.0	0	0	0
National City	763	818	410	7.7	172	172	100
San Diego	11,629	18,827	7,695	3.6	28,241	21,214	75

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan, Environmental Impact Report, January 1977.

TABLE VII-5

Estimated Urbanization of Agricultural Land

	Areas in Agr. Use 1975	% of Total Region's Agr. Land	Agr. Land Developed 1975-95	% of Total Region's Agr.Land Developed
Total Unincorporated Area (Incl. Otay Mesa)	70,714	69	7,726	48.5
Chula Vista	3,091	5	905	5.5
Coronado	0	0	0	0.0
Del Mar	0	0	0	0.0
El Cajon	42	0	6	0.0
Imperial Beach	0	0	0	0.0
La Mesa	5	0	0	0.0
National City	64	0	10	0.0
San Diego	9,470	9	2,324	14.5

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan, Environmental Impact Report, January 1977.

A basic problem in the analysis of land use and urbanization impacts in the area is the lack of common data base throughout the region, particularly in the unincorporated fringe areas. Lack of such data base has caused considerable discrepancies in the land data appearing in reports and plans. The Integrated Planning Office of the County of San Diego is currently in the process of gathering and defining the common data base.

Area A - Portion of Valle De Oro Community Planning Area. Area A, as depicted in Figure VII-5, is within the Spring Valley Sanitation District (SVSD) and the Otay Municipal Water District (OMWD). The OMWD is a large district, controlling approximately 75,000 acres extending from Helix Water District on the north to the USA-Mexico border on the south and to the corporate limits of the Cities of San Diego and Chula Vista to the west. OMWD indicates that Area A, with at least half of the acreage of the New Town Concept, Rancho San Diego, is the only area that the district will provide with sewer service. The area is within the Jamacha and Sweetwater Valleys and is generally referred to as the Jamacha Basin.

OMWD is the agency responsible for the supply of potable water and the collection of sewage from Rancho San Diego and vicinity. That agency has projected the ultimate population of the Jamacha Basin to be 72,500 people, with 58,500 of them initially attributed to Rancho San Diego. The county, however, projected (Series II) an ultimate population of 39,000 people based on a revised land use plan. (The county forecast is shown in Table VII-6.) The OMWD forecast, along with projected per capita flow demand, is shown in Table VII-7.

TABLE VII-6

Area A
Population & Acreage Forecast
Prepared by County

Existing, 1976	
Acreage Developed	1,200
Population	3,600
1990 Urbanization	
Acreage Developed	7,863
Population "Holding Capacity from Land Configuration"	36,000
Population "Reduced to Account for Public Utilities Including Roads"	31,000

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan, Environmental Impact Report, January 1977.

TABLE VII-7

Jamacha Basin Population and Flow Projection
Prepared by OMWD

Period	Rancho San Diego Population Added	Other Basin Population Added	Induced Growth of Population Added	Total Basin Population	Approximate Flow (million gallons)	
					Flow From Population Added	Total Flow
1976				15,757	853	853
1977-1979	10,044	2,405	12,449	28,024	682	2,387
1980-1982	12,123	2,902	15,025	43,049	823	3,891
1983-1985	15,369	3,677	19,046	62,095	1,043	5,757
1986-1988	8,380	2,006	10,386	72,481	569	7,368
TOTAL			72,481			About 60,000

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan, Environmental Impact Report, January 1977.

A high density scenario is used for the area to evaluate the worst possible secondary impacts of its urbanization. The area has light agricultural potential acreage of approximately 1,100 acres for which one dwelling unit (DU) per acre is assumed and about 730 acres to remain undeveloped in the flood drainage plain. Distribution of the remaining acreage and density are projected as follows:

TABLE VII-8

Area A
High Density Scenario:
Dwelling Unit Forecast

Land Category	Acreage	DU/Acre	Total DU
State Acreage	2800	2	5600
Low Density	1000	6	6000
Medium Density	154	14	2156
Commercial + Light Industry	324	4/Commercial Acre	732
Public Use, Parks & Schools	300		
Mountain Development	1400	1/4 acres	350
Open Space	730		
High Density	30	30	900
	6738		15738

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan, Environmental Impact Report, January, 1977.

The 15,738 new dwelling units anticipated by the above table, expected to house the county's projected 1990 population of 36,000, represent a decrease from the level of development expected when the existing Sweetwater interceptor was built. At that time, the projected population was 57,000 residents.

The new Jamacha interceptor is proposed to provide sewer service to Rancho San Diego and vicinity. The interceptor picks up the existing land outfall (Sweetwater-Spring Valley land outfall) just north of Bonita at Sunnyside for a failsafe connection to the metropolitan sewerage system. The entire land outfall starts in Area A near Jamacha Junction, at Steel Canyon, and travels south and southwest, then either north or south of the Sweetwater Lake (depending on which planned alternative is adopted) to the proposed Otay Reclamation Wastewater Treatment Plan. There it picks up the existing interceptor connected to the metropolitan system.

OMWD notes that no local sources of water are available; consequently, all water supplied to the area must be imported from either Colorado or northern California through contractual arrangement with the San Diego Water Authority. The district foresees economical reclamation of the greater portion of its ultimate wastewater (70% or approximately 7 mgd). It is probable that OMWD would ultimately have to discharge approximately 2 mgd to the metropolitan sewer system. If Otay is able to reclaim its wastewater, then undue loading of the metropolitan system would be avoided and Spring Valley Sanitation District (whose present capacity in Metro is 6 mgd) will not have to ask for additional capacity within the metropolitan system in the future. If on the other hand, OMWD is forced to continue ultimate ocean disposal through the metropolitan system and reduce its reclamation efforts, then additional new capacity in the metropolitan system will eventually be required.

Area B - Portion of Valle De Oro Community Planning Area. Area B has about 7,455 acres of developable land, 75% of which (5591 acres) is already developed. The La Presa area has been subdivided and is currently being developed. Total projected population for 1990 is 75,000 people.

The La Presa trunk is constructed and its capacity committed to Rancho San Diego. The improvements planned would correct inadequacies in the trunk line to provide services for already approved Rancho San Diego development and would provide the service needed to urbanize the remaining undeveloped 25% of Area B.

Areas C and D - Sweetwater Community Planning Area. Areas C and D, shown in Figure VII-5, comprise the Sweetwater Valley Planning Area. The area is now approximately 25% urbanized. It is expected to grow from a 1975 population of 8,000 to a 1990 population of 76,390. At present, about 2,500 acres outside the planning area are developed. Approximately 767 acres in the planned area are within the flood-drainage plains. Land use data and projections are given below in Tables VII-9 and VII-10.

TABLE VII-9

Areas C and D
Existing Land Use and Population

Total Acreage in Areas C and D		15,700
Sweetwater Community Planning Area		
Undeveloped	5200	
Developed	2500	
Acreage Outside Planning Area		8,000
Population, 1975 Census in Planning Area		8,000

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan, Environmental Impact Report, January 1977.

TABLE VII-10

Areas C and D
1990 Land Use and Population

Land Use Category	Acres	DU/Acre	Total DU
State Acreage (Min. of .5 acres)	4039	2	8078
Low Density	2235	4	8940
Medium Density	155	29	4495
Commercial	78	4	312
Public Service, Schools & Parks	291		
Open Space	767		
	7565		21825

Population, 1990 in Planning Area: 76,390

Source: Sayed El Wardani, San Diego Metro.Facil.Plan, Environ.Impact Report, Jan. 1977

Areas C and D are within the sewer service area of the City of San Diego and the City of Chula Vista, but do not have direct existing capacity rights in the metropolitan system. New urban development there will be serviced by the metropolitan sewer system through Chula Vista and the City of San Diego. The interceptor is constructed, and only trunk lines will be needed.

Area E - Otay Valley, Otay Mesa, and Brown Field - Border Area. Area E, including Otay Valley, Otay Mesa, and Brown Field Border Area is within the Otay Municipal Water District. The Otay Valley (E_2) is the area extending from the Otay River Valley on the south to Sweetwater River Valley on the north and east of I-805. The area is within the sphere of influence of the City of Chula Vista; it is mostly natural rolling terrain with about 25% dry farming land. At present, it is virtually undeveloped. The agricultural parcels within the Otay Valley area are primarily in the south and southeast portion of Chula Vista's sphere of influence. The area is developable if sewers and access roads are made available. As discussed before, OMWD will furnish sewer service only to Jamacha Basin (Area A).

The City of Chula Vista is 95% developed, not including its recent (1974) annexation of 2000 acres. The annexed area lies north of Telegraph, south of Bonita, and east of I-805 to Otay Lake Road. The 2000 acres are developable and are currently being planned for new urbanization in the area. The newly annexed area will accommodate the equivalent of 4000 single-family dwelling units.

The City of Chula Vista controls 22 mgd capacity in metropolitan system, of which 5.2 mgd empties into the system directly and another 0.8 mgd is discharged through Montgomery and Spring Valley Sanitation Districts. Requirements of Chula Vista and development of the recently annexed 2000 acres will use about 2.5 mgd.

This use level leaves the Chula Vista area with about 13.5 mgd which can be used for additional development within its sphere of influence, including the Otay Valley Area (E_2).

The community of Otay within the Valley is an area between Third Avenue and Main Street and I-805 and I-5. The Otay community is sewered through the Montgomery Sanitation District and is 60% urbanized. Sewers and other public facilities, including access, are available for the area. The area's full development is constrained for economic reasons.

Otay Mesa (E_1) is the area of high grounds south of Otay River Valley and east of I-805 with Brown Field in its center, extending south of the United States-Mexico border. The area is predominantly very productive agricultural farm land on the Mesa, and has some very low density residential developments on the slopes. Potential sewers for the area must come from the City of San Diego unless a new district is formed. The area is outside the sphere of influence of Chula Vista.

The Brown Field Border Area belongs to the City of San Diego. The area is now practically undeveloped except for a small airport. Land speculation has already begun there in anticipation of its selection as the site for a regional commercial airport, even though a decision on the regional airport and relocation of Lindbergh to Brown Field has not been finalized, and the General Plan for the area calls for no development until 1990.

The proposed Brown Field interceptor would replace a small treatment plant currently in operation at Brown Field and provide the necessary connection to the metropolitan system. This facility has been planned in case the regional airport is, in fact, located in the area.

In all probability, the proposed Brown Field land outfall will not be designed until the issue of a regional airport in the area is settled. Should the land outfall be built, the Otay Mesa will open to development. The existing small treatment plant will be abandoned and diverted to the metropolitan system. Development of the remaining acreage (20-25%) in the San Ysidro Border Area would be considered infill in that area. On the other hand, development of the Otay Mesa and east of I-805 would constitute definite peripheral urbanization with potential opening up of agricultural lands in the area for new urbanization pressure.

Should the commercial airport be relocated to the U.S. - Mexico border area, an extension of the Otay Mesa Road is also contemplated. The area west of I-805 to I-5 is within the San Ysidro Community Plan which has been adopted and amended. The San Ysidro Border Area is currently sewered and approximately 70% developed, with another 10-15% tentatively planned but not approved.

Area F - Central and North City. The North City areas have approximately 91,000 acres and a present population of 63,000 people. Growth and land use plans for the North City are currently being studied by the Growth Management Plan sponsored by the City of San Diego. In all probability, the Plan will call for infill development of existing urbanized areas, the City Center Concept and a more compact land use configuration, and slowing and control of fringe urbanization of the North City communities. Existing land use and urbanization impact of the proposed facilities are estimated in Table VII-11.

TABLE VII-11

Area F
Existing Land Use and Urbanization Impact of the Proposed Facilities

Existing Land Use, 1975

Total Area, Includes 8650 acres in San Pasqual	90,973 acres
Developable, now vacant	31,474
Developable, now dry farming and grazing	21,158
Agricultural, San Pasqual Valley	5,056
Developed, July 1975	33,281
Residential	3,130
Commercial	234
Industrial	2,377
Public, including 17,159 acres in Miramar Naval Air Station	20,635
Semi-public such as colleges	1,630
Streets	5,275
Population, plus San Pasqual	63,000 people

1995

Total Area	Remains 90,973 acres; no annexation is anticipated.	
Developed	Increases by an additional 3000 acres as follows:	
Residential		Approximately 1850 acres
Industrial		Approximately 850 acres
Commercial		Approximately 300 acres
Agricultural	Decreases by 3000 acres as follows:	
Dry farming & grazing		Approximately 3000 acres
Crop farming-San Pasqual		No change

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan, Environmental Impact Report, January 1977

The additional 3000 acres to be urbanized will come from the now vacant or dry farming and grazing land and not from the Class I and Class II soils or San Pasqual. The communities to witness most of the additional urbanization and their population growth are given in Table VII-12.

Table VII-12 below indicates that North City will encounter considerable growth, with population more than doubling in 20 years. The communities expected to show the greatest growth impacts are Mira Mesa and Los Penasquitos, which will both double in the next 20 years, and Del Mar Heights, which will triple during that time. Urbanization in the North City is expected to accelerate after 1985 and become most intensified in the Del Mar-Mira Mesa-Penasquitos area.

TABLE VII-12

North City Communities - Population Change

	1975	1995	Change 1975-1995
Mira Mesa	28,000	59,000	31,000
Del Mar Heights	5,600	17,000	11,400
Penasquitos	8,900	17,000	8,100
Rancho Bernardo	12,400	14,000	1,600
Miramar Naval Air Sta.	3,300	3,300	--
Scripps Ranch	4,600	9,800	5,200

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan, Environmental Impact Report, January 1977

Should North City open up for uncontrolled urbanization, sewer services for an ultimate population of about 200,000 could be needed. At present time, flow from North City areas is approximately 4 mgd for a population of 63,000. This level compares with potential urbanization requirements of 25 mgd average. A number of facilities are being constructed and have been proposed to meet this need.

The proposed Tecolote Canyon trunk sewer has been planned, designed and is ready for construction bids. The trunk sewer will carry more capacity than the existing line. It is geared to serve the commercially zoned area from Ruffin Road to I-805 and the area between Balboa and San Clemente Canyon in Kearny Mesa. The trunk capacity will be increased by approximately 2 mgd to accommodate anticipated commercial and light industrial warehousing in the area.

The proposed Kearny Mesa trunk sewer - Phase 3 will replace part of the sewer in the lower part of Murphy Canyon and run a parallel trunk up Kearny Villa Road from Aero Drive to Clairemont Mesa Boulevard. The existing sewer was built some 30 years ago for use by single-family dwellings on the Mesa. Now the area is developed for commercial and light industrial activities which have a higher sewer usage. The trunk has been designed and was due for construction in 1976-77. The parallel trunk, 15-18 inches, will carry excesses of approximately 2 mgd in the upper part and 4 mgd on the lower part. These facilities would contribute to the increasing importance of the Kearny Mesa area as a major employment center.

The East Mission Gorge and East Mission Valley interceptor and trunk sewer have been recently approved. The facilities will accommodate the additional sewage flows from El Cajon, Santee, Lakeside, and Alpine to the Point Loma treatment plant and correct the environmental and health concerns over discharge from these areas into the San Diego River. El Cajon is involved because Santee drains into El Cajon before reaching Mission Gorge. This facility will lift the moratorium on further development in the area. Urbanization of this area will, however, remain restricted until provision for additional capacity in the metropolitan sewerage system is obtained.

The East Mission Bay interceptor is a fairly large project calling for two to three parallel sewers with a capacity of 60-80 mgd. The interceptor would parallel the existing small interceptor which was originally designed to handle the Rose Canyon tributary area including Clairemont, University City, Pacific Beach and La Jolla. The city decided to divert North City to the same interceptor, thus necessitating the large capacity. The North City communities to benefit from the new interceptor and related trunk sewers include Mira Mesa, Penasquitos Canyon, Scripps Ranch, Carol Heights, and the industrial development in Sorrento Valley. The new interceptor has gone through preliminary planning only. Further planning and design await the status of growth and development of the North City.

The Rose Canyon trunk sewer and reclamation treatment plant have not progressed beyond a preplanning stage. The existing trunk was originally built and paid for by the U.S. Navy to serve Miramar Naval Air Station. The proposed new sewer is a 15-inch line in the bottom of Rose Canyon west of the Naval Air Station and needed to service the recent industrial developments along Miramar Road. At the present time, the additional load is light; this situation would change considerably depending on the type of industry attracted to the area. A proposed reclamation plant is planned to use the local effluent from the Naval Air Station and the new industrial development for landscape irrigation of the industrial park as well as nearby freeway and roads. It is not likely, though, that this plant would materialize. Should the facility be constructed, the area has the potential of becoming an important center for warehouse trucking and employment.

The Carmel Valley parallel interceptor is also in the preplanning stage and its development depends on the status of urbanization in the North City.

It is possible that the developed Penasquitos area may hook up to north county sewer systems. San Pasqual Valley has a total of 8651 acres of which 5056 are agricultural, with the preponderance of the Class I and Class II soils available in the North City. The remaining acreage is vacant. The present population of San Pasqual Valley is 200 people. For all practical purposes, it will remain a major agricultural center in the area.

The City of La Mesa has proposed replacement of undersized mains and the Alvarado Canyon interceptor as well as construction of the University interceptor sewer. These projects are intended to increase capacity from existing 15-inch to 25-inch sewers in order to accommodate the anticipated 30% increase in population to be served in the area. This growth is an infill impact of increasing density within the center city, and responsive to a more compact area configuration.

Area G - Poway. The Poway Plan is designed to accommodate a possible increase in population from 23,000 to 46,000 people. The present lack of sewer capacity constrains development in the area. The provision of additional 2 mgd capacity is now being requested by the Pomerado County Water District. If granted, this capacity will encourage the development of the Poway area just east of the present city limits. It will also favor development on the I-15 corridor between Mira Mesa-Scripps Ranch and northerly to Rancho Bernardo. Table VII-13 shows the land use impact of the facilities in the Poway area.

Conclusion: Land Use Impacts. San Diego area growth has dramatically dropped off due to a number of factors, including growth limiting ordinances and control of additional sewage capacity sought within the metropolitan sewerage system. In recent years, the unincorporated peripheral areas of potential urban growth have found sewer service capacity in the metropolitan system not readily available or difficult to obtain. Housing construction activity, responding to "tight money" has also sharply declined in the past few years, affecting not only infill of the already central urbanized areas but the study area and

TABLE VII-13

Land Use Impact - Poway
(for increased capacity to 4 MGD)

	Population	Sewage, MGD	Urbanized Acreage[1]	Building Units[2]
Existing				
Metropolitan System		2.01	3,293	7,601
Septic Tanks		0.63	910	2,366
Total	26,900	2.64[3]	4,203	9,967
Community Plan (1990)	45,000	3.86[4]	6,435	16,203
Projected (for full 4 MGD)	46,497	4.00	6,574	16,731
Impact				
Increase over existing	19,597	1.36	2,371	6,764
Increase over commun.plan	1,497	0.14	139[5]	528[6]

[1] Includes residential, commercial, industrial and support systems.

[2] Includes residential units plus equivalent units for commercial, industrial, etc.

[3] Reflects total demand if all septic tank users were connected to the sewer system.

[4] Assumes some new septic tanks will be installed as others fail & hook into the sewer system; however,it is also assumed that at no time will septic tanks handle more than 10% of demand.

[5] Adopts CPO 1990 residential density of 3.8 & residential: commercial ratio of 17:1.

[6] Adopts CPO 3.0 persons/household in 1990 and a ratio of residential to commercial uses of 17:1.

Source: Sayed El Wardani, San Diego Metropolitan Facilities Plan, Environmental Impact Report, January 1977 the region as well. The demographic characteristics of the metropolitan study area and the region indicate that suburbanization of the area has not ceased, but rather is temporarily halted in response to economic trends and local circumstances.

It is very probable that the demand for housing, pent up by the factors described above, would surge when those restraints are eased. The suburban areas remain relatively attractive. Areas closer to the center of the city are generally also closer to the limit of full build-out and more expensive with higher taxes. The fringe communities, in contrast, have abundant open space and are easily accessible via freeway system. The topography of the area, while limiting growth to the west and south, provides ample growth opportunities to the north and east where an abandance of developable land exists.

It is probable that counter pressures, constraints, and perhaps some absolute limits would be imposed on peripheral growth. Local planning attitudes are already exhibiting that range of impediments by reducing General Plan holding capacities and passing controlled growth initiatives. New values toward open space are gaining strength and sewage treatment capacity is being limited in some cases, such as in the Santee-Lakeside-Alpine area.

In conclusion, there will be pressure to develop, but it will be countered by local attitudes and to varying degrees by local land use regulation. Local government response has been outlined previously in Chapter IV. Comparison of housing market estimates indicated that outside estimates are above what local plans would accommodate. Thus, local plans probably represent the minimum level of future development and pressure will remain for further urbanization.

Community Services and Fiscal Impacts

The increase in population and economic activity forecast to take place by the year 2000 has implications for the provision of public services and facilities through the service area. Among the services which will face increased demand are sewage collection and treatment, water supply, fire protection, police protection, garbage collection and disposal, roads and other transportation services and public works projects, education, general governmental services, and parks and recreation.

The impact of anticipated growth in the San Diego region on the tax burden of local residents and the quality of public services is an issue of increasing citizen and elected official concern. This concern arises in part from the recognition that residential development has typically been associated with, among other things, an inability of public agencies to extend current services and facilities to new growth areas without increasing per capita expenditures and taxes. A more basic underlying concern stems from the pure economics of the situation. That is, residents are experiencing an erosion of real income (San Diego County personal income per capita actually declined an estimated 7% from 1971-1975). While inflation is largely to blame, increased government encroachment on disposable personal income is also being cited as a source of the problem. In any case, citizen resistance to increased taxes will make it imperative that public services are provided efficiently.

The added community services and facilities will result in an increase in the costs of the government agencies which supply them. At the same time, new development will increase the local tax base. The fiscal impact of growth is individual to the service-providing entities; the regional fiscal impact of growth is only the aggregate of the local impacts, a point receiving further discussion in the next section. The investigation of the impacts of growth on public service requirements in the region is part of the ongoing growth management activities of the San Diego Comprehensive Planning Organization in cooperation with the cities, county, school districts and other special service districts. CPO's Fiscal Impact Study of Regional Growth has not yet been completed. Until this study is completed no quantitative data will be available on the capacity of existing systems, public service standards and projected costs and revenues. Therefore, the section that follows can only qualitatively discuss the issues involved.

Fiscal Impacts. The major fiscal issue related to growth is that of whether the provision of public services to new users will affect the quality or quantity of these services to existing users and of whether the existing costs of these services will be affected. The often-heard question of "whether growth pays for itself" is usually directed to the concern that the provision of public services to new users could increase the costs to all those paying taxes and user charges without increasing or improving the service outputs to existing users.

As shown in Table VII-14, there are circumstances in which the costs of providing additional public services exceed the revenues generated by the new users and new taxpayers so that the net result or fiscal impact is an increase in costs to all users and taxpayers within the relevant public service jurisdiction.

It is not possible to generalize as to whether new development will have a positive or negative fiscal impact on existing service users and taxpayers. The fiscal outcome is determined by five factors:

- the make-up of the existing population;
- the type of development experienced (scale, type and value of land uses);
- the status of capital facilities in the relevant service districts at the time the demand for service increases (i.e., the presence or absence of unused capacity);

TABLE VII-14

Incidence of the Fiscal Impacts of Growth Generated by an Increase In the Demand for Public Services

Interest or Actor	Benefit	Cost
Recipients of additional public service outputs (such as new residents).	Public service outputs.	Public taxes and user charges.
Existing taxpayers and existing recipients of public services in jurisdictions providing the additional public service outputs.	Reduced taxes and user charges if new users generate a net surplus of revenue over costs.*	Increased taxes and user charges if new users generate a net deficit of costs over revenue.*
Local municipalities and special purpose districts providing the additional service outputs.	A net fiscal surplus if revenues exceed costs.	A net fiscal deficit if costs exceed revenues.
Local municipalities and special purpose districts other than those providing the additional public service outputs.	Avoidance of service system expansion (if efficient levels of operation have been reached).	Failure to achieve efficient levels of operation (if now operating at lower than optimum rate of output).
Existing taxpayers and existing recipients of public services in jursidictions other than those providing the additional public service outputs.	Indirect benefits or costs depending upon which of the two conditions above apply.	

*Circumstances under which these conditions would be experienced are discussed in the text.

Source: Gruen Gruen + Associates, June 1977

- the laws and policies concerning the types of taxes that are used to pay for the various kinds of public services; and
- the policies that the relevant service districts apply to the setting of fees and user charges.

Cost considerations. The major consideration with regard to the impacts of growth on the costs of a particular public service are (1) the distribution of total costs of that service between costs that are fixed (costs associated with the use of resources such as land, buildings and heavy machinery whose costs cannot be varied for a given set of capital facilities) and costs that are variable (the costs of those resources such as labor and supplies which can be varied), and (2) the capacity at which the existing capital facilities are operating.

For those types of public services requiring large investment in capital facilities such as in a sewage treatment plant or a water reservoir, fixed costs are likely to represent a large percentage of total costs. As a result, costs per unit of service output could increase or decrease with the provision of additional output, depending upon the extent to which the capacity of existing facilities was being used at the time when the demand increased. If excess capacity existed, per-unit service costs would decrease, since the fixed costs would be spread over more units of output. However, if existing facilities were operating at capacity, additional service demand would either stretch existing facilities beyond their optimum rate of output or necessitate investment in new capital facilities, both of which are likely to increase per-unit costs.

For public services in which variable costs represent the larger share of total costs, per-unit costs of service output are unlikely to be affected by an increase in service demand and total costs. Costs per unit of output for these types of services - which would include police protection and other personal government services - are determined much more by the quality or type of service provided as related to the desires and needs of the community (related to socio-economic make-up of the population) than by the quantity of services provided, per se, in terms of the size or growth of the population served.

Revenue Considerations. The net fiscal impact depends on the particular nature of the user charges and tax rates for generating service revenues as well as the relationship between the revenues generated and the applicable set of costs determined as discussed above. Many local public services are supported primarily by property taxes. While it is true that higher-valued properties can generate higher tax revenues than those of lower value, there is no property value level at which, as a rule of thumb, one could say that a net fiscal surplus will or will not result. It is the present and future mix of land uses - in terms of type and value - that determines net fiscal impact. There are differences among land use categories in terms of their demand for services and the revenues they generate. Industrial and commercial uses, for example, do not directly generate demand for educational services, although they generate revenue to the school districts providing those services. Residential uses, on the other hand, do generate educational costs; whether they also generate enough revenues to offset those costs depends on the value of the development and the number of school-age children housed.

Net Fiscal Impacts and Land Use Planning. The type of growth a particular community experiences will influence its future service requirements and costs and will determine its revenues as well. When viewed from a regional perspective, growth per se is likely to bring a mix of uses including residential uses which provide housing for the workers in the industries and commercial establishments. "Less fiscally desirable" uses must go somewhere within the region if the "more fiscally desirable" ones are to continue to exist there. But, though a balance of uses may exist in the region as a whole, a local community may have a higher than average share of either type of development, depending on the community's location, market assets and historic land use mix. An individual community may attempt to influence its fiscal condition by attracting "high value" development (such as major retail or industrial uses) and discouraging "low value" development (such as inexpensive housing with high demand for public education). This kind of fiscal rivalry can result in less efficient regional land use patterns than would occur absent the fiscal pressures under which most local governments operate.

On a local area basis, land use patterns can be planned to minimize the costs of providing capital facilities and the day-to-day costs of providing government services. For example, higher density residential development may have lower per-unit road requirements and, thus, lower unit costs for roads; this results in lower unit costs for street lighting and street maintenance.

However, even where land use patterns are designed to minimize costs, this does not guarantee that revenues will exceed costs or, more importantly, that development in that location would be the least costly. Certainly that development would not be least costly in the short run if it requires the construction of new facilities while excess capacity for services exists elsewhere in the region at a location which the new uses would find desirable.

Air Quality Impact

Introduction. Wastewater treatment facilities are an essential requirement of modern urban areas. Their availability is one of several major factors influencing the type, amount, location, and timing of urban development. Future development accommodated by the proposed project will influence air quality both within the project service area and elsewhere in San Diego County. The indirect air quality impacts of continued development involve air pollutants associated with increased vehicle traffic and the development of new stationary sources of air pollution.

As noted previously, several local, regional and state agencies have been involved since mid-1974 in evaluating the air quality implications of development trends in San Diego County. The air quality evaluation efforts of these agencies are continuing under the Air Quality Maintenance Plan (AQMP) program. In addition, air quality forecasting procedures are continually being refined, and basic data sources are currently being revised. The analysis presented in this EIS is based on the "RAQS" documents previously published.

Emissions Forecasts. The emissions forecasts presented in the RAQS reports apply to the (former) San Diego Air Basin area, and are based on the version of CPO's Series II population forecasts presented in Table A of Appendix G. Using the Series II and preliminary Series IV population forecasts, and forecasts of average daily VMT correlated with these population forecasts (Table B of Appendix G), the RAQS emissions forecast was adjusted to a Series IV population basis. Emission forecasts for the project service area were also derived from the RAQS data based on relative population distributions. Table VII-15 summarizes the resulting emissions forecasts for the air basin and project service area. Appendix G presents these forecasts in somewhat greater detail.

The procedures described above were employed so that the air quality tactics described previously in Table II-11 could be more easily evaluated for their effectiveness under a Series IV development scenario. Several limitations are inherent in the procedures used. Major data sources and assumptions used in the RAQS studies have been incorporated into the Series IV-based data used in this EIS. Thus, any errors or inaccuracies inherent in the RAQS forecasts are also present in the adjusted emissions forecasts presented here. Some of the more significant factors in this regard are identified below.

Table VII-15

COMPARISON OF AIR BASIN AND METRO SERVICE AREA EMISSION PROJECTIONS (TONS PER DAY) BASED ON SERIES II AND SERIES IV POPULATION FORECASTS

Geographic Area	Forecast Basis	1972						1980						1985					
		TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part
Air Basin	Series II	338.1	279.0	251.0	36.4	1,227.2	107.0	295.6	224.8	242.0	109.6	918.6	121.5	291.4	215.2	211.0	87.7	789.0	126.1
	Series IV	338.1	279.0	251.0	36.4	1,227.2	107.0	283.0	214.1	227.6	108.2	845.4	119.0	279.7	205.0	196.2	86.8	715.2	123.4
Metro Service Area	Series II	276.9	228.4	205.6	29.8	1,005.0	87.6	242.3	184.4	199.2	89.9	753.1	99.7	239.9	177.1	174.4	72.2	649.3	103.8
	Series IV	276.9	228.4	205.6	29.8	1,005.0	87.6	226.6	171.5	182.3	86.6	677.1	95.3	220.8	161.8	154.9	68.5	564.7	97.5

Geographic Area	Forecast Basis	1990						1995					
		TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part
Air Basin	Series II	299.4	217.8	190.0	91.1	734.8	130.8	314.5	223.6	195.0	94.8	788.0	140.1
	Series IV	291.1	210.8	182.8	89.6	690.4	127.9	306.1	217.5	189.6	92.6	759.4	136.4
Metro Service Area	Series II	245.3	178.4	157.2	74.4	601.8	107.0	256.9	182.7	160.1	77.4	643.7	114.4
	Series IV	227.6	164.8	143.0	70.0	539.8	100.0	237.6	168.8	147.2	71.9	589.5	105.9

Source: All data from Tables C, D, E, and F in Appendix G. Anticipated emissions reductions due to implementation of the adopted RAQS tactics are not incorporated into these projections.

The preliminary Series IV forecasts used for this analysis have since been modified by CPO. The revised Series IV forecasts have not yet been formally adopted by any local agencies, and may be further revised in the future. A completely new emission inventory base for calendar year 1974 is being prepared by the APCD, and would represent a technically better basis for emission forecasting purposes. These data, however, were not available in time for use in this report.

The vehicle emission factors used for the RAQS studies were based, at least in part, on a California Air Resources Board report which underestimated vehicle emission rates. The APCD's 1974 emission inventory is using a more recent EPA document (U. S. Environmental Protection Agency, 1976a; normally referred to as "Supplement 5 to AP-42"). This document has itself been recently replaced by a new document (Supplement 8 to AP-42) which indicates that "Supplement 5" significantly underestimated the deterioration rate of vehicle pollution control devices.

Techniques for Evaluating Future Ambient Air Quality. A large number of different procedures have been developed for estimating ambient air quality changes under specified conditions. Many of these procedures are appropriate only for certain types of projects (highways; parking lots; major point sources such as power plants, etc.). When the impact of generalized urban development is the primary concern, available procedures can generally be classified into two categories: "mechanistic" simulation models of variable complexity; and simple statistical extrapolations from historical data.

The major appeal of complex simulation models lies in the fact that they can be structured to explicitly deal with the numerous factors which are known to affect ambient air quality. In general, a usable simulation model should deal with the following factors:

- Spatial and temporal distribution of emission sources.
- Meteorological and topographic factors influencing pollutant transport.
- Meteorology and atmospheric chemistry affecting the residency of primary pollutants (directly emitted pollutants) and the formation of secondary pollutants (generated from primary pollutants by chemical reactions in the atmosphere).

This potential for dealing with the "real world" complexities of the various processes which affect air quality is also the basic reason such models are seldom used. As such models are made more complex to reflect actual physical and chemical processes occurring in the atmosphere, the requirements for detailed, geographically specific base data increase substantially. Most of this required data is not readily available and must be developed through special and/or long-term studies. In addition, as these models become more complex, it becomes necessary to use advanced computer technology to perform the required calculations. The results of such models, no matter how complex, can be no more accurate than the base data and mathematical equations used in the model to describe physical and chemical processes occurring in the atmosphere.

The rollback procedure, on the other hand, avoids any attempt to deal explicitly with the complexities discussed above. Changes in ambient air quality are assumed to be proportional to changes in total emissions of the pollutant of concern (or the precursor emission products for secondary pollutants). Natural background levels of pollutants can be considered as a special factor if data are available. In addition, the basic rollback equation (see notes to Table VII-17) can be modified to account for influx of pollutants from outside the study area if data on this are available, although this is seldom done.

While simulation models are often designed to forecast a geographic distribution of pollutant levels, the rollback technique produces a single value for future air quality. Depending on the base data used in the rollback analysis, this may represent a potential "worst case" situation, average hourly pollutant level, etc.

The following simplifying assumptions inherent in the rollback approach must be recognized when determining how to use this procedure or how to interpret its results. Pollutant emissions are assumed to be constant through time and geographically uniform. Transport of pollutants into or out of the study area is normally assumed to be negligible. Meteorological factors are not directly considered; implicitly, the rollback technique assumes that meteorological conditions in a future year are essentially identical to the base year used. Finally, chemical reactions among pollutants are not considered. Some of these limitations are counter-balanced by using the highest reported pollution levels as base values in the model; such a procedure assumes that this represents a combination of unfavorable conditions.

It should also be apparent that the rollback procedure is most appropriately used to evaluate the air quality implications of a given overall amount of development. It is not, however, well suited to comparing the air quality implications of alternative spatial distributions of land use or alternative time distributions of pollutant-generating activities.

Interpretation of the results of any air quality analysis should recognize that all forecasting procedures and models are best utilized for estimating air pollution potential rather than making air quality projections (in the same sense that population projections are made). On a year-to-year basis, air quality is usually determined primarily by weather patterns and conditions. The ability to predict future ambient air quality conditions is limited by numerous considerations, not the least of which is the inability to confidently predict future weather conditions in any detail. Thus, even the most sophisticated computer models which may be developed in the foreseeable future will be unable to predict ambient air quality conditions for specific dates in the future. Current and anticipated air quality models are more properly utilized to predict the potential for meeting or exceeding established air quality standards based on pollutant emission forecasts for given future years. Rollback techniques approach this issue through the use of "base year" data reflecting serious pollution episodes experienced in the recent past. A "worst case" analysis can be approximated by using the year showing the highest ratio of observed peak ambient pollution level to estimated daily emissions of the appropriate pollutant.

Ambient Air Quality Forecasts. Ambient air quality projections for oxidants, nitrogen dioxide, sulfur dioxide, and carbon monoxide have been prepared for both the Air Basin and the project service area, using normal "rollback" procedures. Peak ambient air quality levels for 1972 (Table VII-16) were used as base levels in these projections because the 1972 emissions inventory was the only base year inventory available. This assessment of air pollution potential (Table VII-17) analyzed two time periods for carbon monoxide levels (one-hour and eight-hour averages). Two procedures were used to evaluate potential one-hour oxidant levels: the linear rollback procedure and EPA's "Appendix J" procedure. EPA's "Appendix J" procedure consists of a specific graphical relationship between morning (6:00 a.m. to 9:00 a.m. average hourly level) nonmethane hydrocarbon levels and subsequent maximum one-hour oxidant levels. This procedure (Appendix H of this EIS) provides a nonlinear relationship between oxidants and precursor hydrocarbons.

Table VII-16

1972 PEAK AMBIENT AIR QUALITY READINGS

Station	Maximum 1-Hour Averages				8-Hour
	Ox	NO_2	CO	SO_2	CO
Chollas Heights	0.22				
Chula Vista	0.25				
El Cajon	0.19	0.24	12	0.04	
Escondido	0.27				
Mission Valley	0.15	0.25			
Oceanside	0.23				
San Diego-8th and E	0.14	0.22	39	0.06	18

NOTES:

All values in parts per million (ppm) by volume.

Oxidant (Ox) values corrected by 0.85 factor to reflect recent change in instrument calibration procedures.

SOURCES:

California Air Resources Board, 1972 and 1974c.

Table VII-17
PROJECTED AIR POLLUTION POTENTIAL IN THE AIR BASIN AND METRO SERVICE AREA

Geographic Area	Forecast Basis	1972						1980						1985					
		Oxidant Roll.[1]	Oxidant FR[2]	1-Hr NO_2	1-Hr SO_2	1-Hr CO	8-Hr CO	Oxidant Roll.[1]	Oxidant FR[2]	1-Hr NO_2	1-Hr SO_2	1-Hr CO	8-Hr CO	Oxidant Roll.[1]	Oxidant FR[2]	1-Hr NO_2	1-Hr SO_2	1-Hr CO	8-Hr CO
Air Basin	Series II	0.27	0.27	0.25	0.06	39	18	0.22	0.25	0.24	0.18	29	13.5	0.21	0.25	0.21	0.14	25	11.6
	Series IV	0.27	0.27	0.25	0.06	39	18	0.21	0.25	0.23	0.18	27	12.4	0.20	0.24	0.20	0.14	23	10.5
Metro Service Area	Series II	0.25	0.25	0.25	0.06	39	18	0.20	0.23	0.24	0.18	29	13.5	0.20	0.23	0.21	0.15	25	11.7
	Series IV	0.25	0.25	0.25	0.06	39	18	0.19	0.23	0.22	0.17	26	12.2	0.18	0.22	0.19	0.14	22	10.2

Geographic Area	Forecast Basis	1990						1995					
		Oxidant Roll.[1]	Oxidant FR[2]	1-Hr NO_2	1-Hr SO_2	1-Hr CO	8-Hr CO	Oxidant Roll.[1]	Oxidant FR[2]	1-Hr NO_2	1-Hr SO_2	1-Hr CO	8-Hr CO
Air Basin	Series II	0.21	0.25	0.19	0.15	23	10.8	0.22	0.25	0.20	0.16	25	11.6
	Series IV	0.21	0.25	0.18	0.15	22	10.2	0.21	0.25	0.19	0.15	24	11.2
Metro Service Area	Series II	0.20	0.23	0.19	0.15	23	10.8	0.20	0.23	0.20	0.16	25	11.6
	Series IV	0.18	0.22	0.18	0.14	21	9.7	0.19	0.23	0.18	0.14	23	10.6

NOTES AND SOURCES:

1972 peak ambient air quality levels from Table VII-16.

[1] Roll. = linear rollback procedure (see below).

[2] FR = Federal Register, 36(158) (August 14, 1971) Appendix J procedure.

Except for "Appendix J" analysis-of-oxidant levels, all analyses are based on the linear "rollback" procedure:

$$AQ_{fy} = B + (AQ_{by} - B) \times \frac{E_{fy}}{E_{by}}$$

Where:
AQ = Ambient air quality (ppm)
B = Natural background air quality level (ppm)
E = Emissions of precursor pollutant (tons per day)
by = Base year, 1972
fy = Forecast year

Base year and forecast year emissions from Table VII-15. Reactive organic gases (ROG) used as oxidant precursor. NO_x used as NO_2 precursor. SO_x used as SO_2 precursor.

Effects of the adopted RAQS tactics are not considered.

Assumed background pollutant levels:

Oxidant background:	0.01 ppm (see text)
NO_2 background:	0.004 ppm (California Air Resources Board, 1974a, Table A in Appendix F)
SO_2 background:	0.0002 ppm (Table A in Appendix F)
CO background:	0.10 ppm (Table A in Appendix F)

Federal Register "Appendix J" analysis of oxidant based on upper limit curve for max-hour oxidant level vs 6:00 to 9:00 a.m. non-methane hydrocarbon levels (Appendix H).

Applicable ambient air quality standards:

Oxidant:	0.08 ppm
NO_2:	0.25 ppm
SO_2:	0.50 ppm
CO (1-hr):	35.0 ppm
CO (8-hr):	9.0 ppm

Potential levels of suspended particulates were not calculated. While particulate emission forecasts were prepared, these primary emissions are not well correlated with ambient air quality levels of suspended particulates. Monitored particulate air quality levels contain a significant fraction of secondary aerosols formed largely through photochemical reactions involving SO_x, NO_x and organic gas emission products. Procedures for estimating levels of these secondary aerosols are not well developed, since routine air quality monitoring does not distinguish between primary and secondary aerosols.

The calculations performed for this EIS utilized estimates of natural background pollutant levels from various sources as identified in Table VII-17. The natural background oxidant level assumed for the linear rollback calculation requires some discussion. Several studies have been undertaken in remote areas in an effort to define natural background oxidant levels. Values as high as 0.04 ppm have been reported by these studies (U. S. Department of Health, Education and Welfare, 1970; California Air Resources Board, 1974a). These high "background" levels seem to be due to one of two mechanisms: long distance transport of oxidants from major urban areas; or ozone transferral from high altitudes due to deep, turbulent mixing. Such deep, turbulent mixing is incompatible with smog episode conditions. It should also be pointed out that a persistent background oxidant level of 0.04 ppm is inconsistent with levels documented as producing visible injury to native vegetation and crops (Detwyler, 1972; Heath, 1975; Thomson, 1975; Miller and McBride, 1975; Horsman and Wellburn, 1976). Thus, a value of 0.01 ppm was used in this EIS as an oxidant background level, rather than the 0.04 ppm level suggested by various EPA and ARB documents.

For reasons explained in the "Pollutant Transport Patterns" section of the EIS, pollutant transport from the South Coast Air Basin was not considered in the analysis presented in Table VII-17.

Emissions Rollback Analysis. The linear rollback formula and EPA's "Appendix J" procedures can be used to estimate an emission limit for achieving and maintaining ambient air quality standards. These emission limits are presented in Table VII-18. Table VII-19 illustrates the extent to which projected Air Basin or project service area emissions (Table VII-15) would have to be reduced in order to attain applicable air quality standards in various years. This analysis verifies that attainment and maintenance of the federal oxidant standards will require a tremendous reduction from projected reactive organic gas emission levels (60 to 85 percent reductions,

Table VII-18

EMISSIONS LIMITS FOR ATTAINMENT OF AMBIENT AIR QUALITY STANDARDS
(TONS PER DAY)

AIR QUALITY STANDARD:	1-HOUR OXIDANT		1-HOUR NO_2	1-HOUR SO_2	1-HOUR CO	8-HOUR CO
Precursor Emissions:	Reactive Organic Gases		NO_x	SO_x	CO	CO
Geographic Area	Rollback	FR Appendix J*				
Air Basin	75.1	33.5	251	304.2	1,101	610.2
Metro service area	66.6	42.3	228.4	249.1	901.7	499.7

NOTES AND SOURCES:

Except for the "Appendix J" analysis of reactive organic gases, all emission limits are derived by solving the linear rollback equation (see notes in Table VII-17) for a future ambient air quality value equal to the appropriate federal or state standard. "Appendix J" procedures are described in Appendix H of this EIS. 1972 data used for all calculations.

FR = Federal Register

*The more stringent emissions limit for the Air Basin than the Metro Service Area appears to reflect the fact that relative oxidant levels in these two geographic areas are not proportional to relative emissions of reactive organic gases (ROG). While the Metro Service Area recorded a 1972 peak oxidant level which was 92.3% of the basin-wide peak, the service area produced only 81.9% of the air basin ROG emissions. The percentage emission reductions dictated by the "Appendix J" curve (Figure B of Appendix H in this EIS) are proportional to the relative peak oxidant levels, not the relative ROG emissions. Using 1972 data, the required percentage ROG reduction for the Metro Service Area is 92.6% of that required for the Air Basin.

Table VII-19

REDUCTIONS FROM PROJECTED EMISSIONS NECESSARY TO INDICATE ATTAINMENT OF AMBIENT AIR QUALITY STANDARDS (PERCENTAGE AND TONNAGE REDUCTIONS, AVERAGE DAILY EMISSIONS BASIS)

AIR QUALITY STANDARD:		1-HOUR OXIDANT					1-HOUR NO_2		1-HOUR SO_2		1-HOUR CO		8-HOUR CO	
Precursor Emission Product: Reactive Organic Gases							NO_x		SO_x		CO		CO	
Geographic Area	Forecast Basis	Forecast Year	Rollback		FR Appendix J									
			%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons
CPO Area	Series II	1972	73.1	203.9	88.0	245.5	0	0	0	0	10.3	126.2	50.3	617.0
		1985	65.1	140.1	84.4	181.7	0	0	0	0	0	0	22.7	178.8
		1990	65.5	142.7	84.6	184.3	0	0	0	0	0	0	17.0	124.6
		1995	66.4	148.5	85.0	190.1	0	0	0	0	0	0	22.6	177.8
	Series IV	1972	73.1	203.9	88.0	245.5	0	0	0	0	10.3	126.2	50.3	617.0
		1985	63.4	129.9	83.7	171.5	0	0	0	0	0	0	14.7	105.0
		1990	64.4	135.7	84.1	177.3	0	0	0	0	0	0	11.6	80.2
		1995	65.5	142.4	84.6	184.0	0	0	0	0	0	0	19.6	149.2
Metro Service Area	Series II	1972	70.8	161.8	81.5	186.1	0	0	0	0	10.3	103.3	50.3	505.3
		1985	62.4	110.5	76.1	134.8	0	0	0	0	0	0	23.0	149.6
		1990	62.7	111.8	76.3	136.1	0	0	0	0	0	0	17.0	102.1
		1995	63.5	116.1	76.8	140.4	0	0	0	0	0	0	22.4	144.0
	Series IV	1972	70.8	161.8	81.5	186.1	0	0	0	0	10.3	103.3	50.3	505.3
		1985	58.8	95.2	76.9	119.5	0	0	0	0	0	0	11.5	65.0
		1990	59.6	98.2	74.3	122.5	0	0	0	0	0	0	7.4	40.1
		1995	60.5	102.2	74.9	126.5	0	0	0	0	0	0	15.2	89.8

NOTES: Based on data in Tables VII-15 and VII-18.

FR = Federal Register

depending on target year and forecasting procedure used). Reductions from projected CO emission levels will also be necessary to achieve the federal 8-hour CO standard, but the necessary emission reductions are much lower than those required for attainment of the oxidant standards.

Natural Resources Impacts

Future development in the San Diego area will eliminate acreage of natural vegetation and its associated wildlife. Increased levels of human activity and the presence of domestic pets will result in additional impacts on wildlife in the area. The potential for wildfires may also increase in certain areas, with resultant impacts on both the developed areas and surrounding open spaces.

Continued development in the San Diego area will probably result in adverse impacts on biological resource areas of scientific and educational importance due to the increase in use of known localities and the lack of information and protection of obscure localities.

Cultural Resources Impacts

Given that many localities in the San Diego area have not been surveyed for archeological or historical resources, a definite potential exists for loss of these resources as the result of urbanization. Loss could occur through direct disturbance of sites during construction and through vandalism or other disturbance of sites protected from construction. Improved access or publication of information can result in willful destruction, while construction losses can result from ignorance or neglect in seeking professional inspection of development sites.

Water Quality Impacts

Urbanization of undeveloped lands and infilling in developed areas may cause degradation of surface and groundwater quality during and after development. Surface waters can be degraded by construction debris and sediment and from urban runoff. Both surface and groundwaters can be contaminated by salts, heavy metals, biocides, insecticides, pesticides, and other substances carried in urban runoff and landscape irrigation. Of growing concern are heavy metals and other substances washed from street and parking lot surfaces and petroleum products and other chemicals disposed of through storm drain systems.

Fire and Geological Hazard Related Impacts

Future development in the San Diego area permitted by the provision of wastewater treatment facilities will be subject to geologic hazards - earthquake shaking, flooding, landsliding, loss of mineral resources, erosion, expansive soils, fault displacement, tsunami and subsidence - and fire hazard. The potential severity of each hazard depends on the location of developments. Areas which in the past were avoided due to the potential for hazards may be subject to development pressures because of their proximity to new and existing community services and the rising cost of land. Of particular note will be development in the South Bay Otay Mesa areas on land now in agriculture or in designated open space. The potential for extensive development in the Tia Juana River floodplain is already becoming a reality.

Noise and Visual Quality Impacts

Urbanization of presently undeveloped areas will increase ambient noise levels. Chief contributer to noise levels will be motor vehicles. Transportation corridors such as freeways and expressways concentrate the noise generators into linear segments. Future residents of developing areas will be subjected to increasing ambient noise levels as urbanization increases.

Residential and commercial development whether infilling or fringe development will decrease open space, agricultural lands and/or wildlands. Such open areas have a visual or perceptual value that is lost in enclosed/developing areas.

Determination of Suitability of Flows

Current daily per capita sewage generation rates in the project service area average about 90 gpcd (gallons per capita per day). Flows from different contributory agencies vary considerably, ranging from 57.1 gpcd for the City of Del Mar to 145.6 gpcd for the City of Coronado (Lowry & Associates, 1976).

Table VII-20 presents an assessment of the time frame for full utilization of various project capacity levels under the Series II and preliminary Series IV growth rates for the project service area (see Table III-10). This analysis assumes a constant 90 gpcd sewage generation rate and 100 percent sewerage of the service area population.

It is anticipated that flow conservation measures could result in a conservative 15 percent flow reduction. This could be obtained via installation of low flush toilets and

Table VII-20

TIME FRAME FOR USE OF VARIOUS PROJECT CAPACITY LEVELS UNDER SERIES II AND SERIES IV GROWTH RATES

Project Capacity (mgd)	Equivalent Population Capacity	Year of Full Capacity Utilization Assuming Series II Growth	Year of Full Capacity Utilization Assuming Series IV Growth
120	1,333,300	late 1976	mid 1977
150	1,666,700	late 1985	early 1988
160	1,777,800	late 1988	early 1992
200	2,222,200	early 2000	early 2006

NOTES:

Per capita daily sewage generation assumed to be 90 gpcd (Lowry & Associates, 1976).

100 percent sewerage of the service area population assumed.

Analysis performed by logarithmic growth rate interpolations using population values presented in Table III-10. Post-1995 growth rates assumed equal to 1990-1995 growth rates.

pressure reduction devices in the shower heads for new developments. Generally the builders are installing these devices on a voluntary basis in new developments. During the course of the study period, existing high volume flush toilets would be gradually phased out due to voluntary installation of new devices and/or replacement of units due to malfunction. A reduction of possibly 50 percent might be obtained through the use of new technological devices incorporated into the toilet and shower. However, implementation of this type of program would require some form of mandatory requirement for installation of these devices.

Impact of Flow Reduction. Normal plant operation could be easily modified to account for any concentration increases, should effective conservation measures be implemented.

Difficulties might be experienced in the San Diego collector and interceptor sewer systems. Flow reductions would increase residence time, thereby encouraging formation of H_2S, a problem already experienced in the San Diego system. The problem of flow blockages as experienced in Marin County might occur, but would likely be a problem for the local trunk sewers and collectors rather than the interceptor system. This problem can be mitigated by periodic inspection, maintenance and flushing with secondary effluent.

VIII. MITIGATION MEASURES

EPA Relationship to Mitigation Measures

NEPA and CEQA require consideration of mitigation for all project impacts. EPA has special responsibilities to assure that adverse impacts are eliminated or minimized to the maximum extent possible through mitigation measures in cases where federal statutes, executive orders and regulations would be contravened. For example, increased emissions from additional vehicle use (accommodated by an EPA-funded project) that would prevent the mandated attainment of regional air quality standards is an impact which is the concern of EPA. It is beyond the scope of the EIS process to detail planning necessary for the immediate implementation of each proposed mitigation measure. None of the mitigation measures proposed are specifically required by EPA; rather, EPA believes that it is only the local governments which should determine which measures are appropriate to specific circumstances. Actions taken in connection with the Encina Joint Powers Agency Project provide an example of an approach which may be necessary for the San Diego Metro Project. In connection with the Encina Project, CPO adopted an accelerated implementation schedule for several of the RAQS tactics (Appendix K).

The total responsibility for developing detailed mitigation measures during the remaining planning and impact analysis efforts rests upon the City of San Diego and its consultants, as well as appropriate local and regional planning agencies. EPA views its role to be that of providing guidance in the development and analysis of such measures and, in the end, determining the extent of benefit of such measures in reducing the accommodated impacts associated with grant-funded projects. Wastewater treatment plants have some effects that tend to be relatively independent of any particular alternative. Since no specific alternative has been selected, and since alternatives are numerous and their precise location and design not yet developed, this chapter focuses primarily on mitigation measures which would generally apply to the alternatives as developed to this point.

Measures to Minimize Construction Impacts

The City of San Diego has the capability to mitigate all of the potential primary impacts associated with the construction and operation of any of the alternatives. These impacts are relatively minor in effect and magnitude and, in most cases, the impact can be effectively mitigated. This can be accomplished through proper planning and in subsequent detailed design document development and construction implementation, along with continuing monitoring, supervision and stringent enforcement during construction. The inclusion in contract specifications of specific requirements under local, regional and statewide codes places legal requirements to implement mitigation measures on the contractor who is doing the work. The impacts considered and their mitigation are given in Table VIII-1.

Measures to Minimize Primary Operational Impact

Primary operational impacts result from the location and operation of the facilities and generally remain in effect for the life of the project. These impacts tend to be on or near a facility's site or pipeline route or in the area of wastewater disposal. Some are generally common to all alternatives in that the magnitude of variation in degree of impact is small. The following list indicates those impacts considered significant and possible mitigation measures. Specific mitigation measures (i.e., those related to specific sites) will be given specific facility/system.

Flood Hazard Associated With Location and Operation of Treatment Plant

Location of a sewage treatment plant and sludge-drying beds requires that special design consideration be given so that the facilities are able to function completely and properly during periods of flooding. This is especially appropriate for those sites located in the Tia Juana River Valley floodplain (i.e., Imperial Beach Naval Air Station, Hollister Avenue and Monument Road, Dairy Mart Road, Twenty-seventh Street and Sunset Avenue and Palm City).

Increase in Noise Levels Because of Treatment Plant Operation

Pumps, generators and other equipment at the plant site will produce noise levels which could be distracting to nearby residents, workers or visitors to the area. The relative magnitude and importance of such noise impacts have not been determined and should be further investigated during the site selection process. Pumps and other equipment could be housed in insulated buildings or be installed with mufflers and baffles to reduce noise levels.

Visual Impact of Treatment Plant and Other Sewage Facilities

Treatment facilities could be treated architecturally and with landscaping to produce attractive physical structures.

TABLE VIII-1

CONSTRUCTION IMPACT MITIGATION MEASURES

Construction Impact	Mitigation Measure
Effect of spoil disposal	Locate spoil disposal sites in areas that would minimize aesthetic impact and damage vegetation. Replant permanent spoil sites with native vegetation.
Alteration of topography by excavation for pipelines	Use naturalized grading techniques, equalize cuts and fills, discourage use of borrow pits, use existing road/pipeline rights-of-way.
Changes in natural drainage patterns by construction	Alterations should be kept to a minimum with any altered flow returned to a natural condition immediately downstream.
Alteration, erosion of soils resulting from excavation, grading, backfill	Any backfilling should be done with care to maintain original soil horizons, stockpile topsoil for later use. Revegetation should be accomplished to conform to original conditions. Work scheduling of excavation and any earthwork should avoid rainy seasons.
Sediment and debris runoff	Use control measures (such as sediment traps, basins, diversion ditches, benches, etc.) to prevent sediment-laden runoff and maintain a constant program of debris collection.
Disruption of mature trees	Inventory all trees, reroute pipelines, use protective measures (such as flags, fencing, staking, etc.) on existing trees where construction is necessary.
Disruption of vegetation communities, animal habitats, erosion by clearing	Inventory critical areas, reroute construction activities, use selective clearing, use smallest area necessary for work, revegetation to conform to original plant materials, revegetate with fast growing species in high erosion potential areas.
Increased fire hazard potential from construction activity	Use spark dampers on equipment, stockpile water, tools, clear debris, schedule construction activities within high risk areas in cool weather seasons. Restrict smoking to designated areas and conditions.
Alteration, destruction of archeological resources if unavoidable	Perform all necessary surveys in conformance to state/federal regulations before design and construction, reroute construction activities as necessary, alert work crew to general appearance of archeological resources.
Spills of fuel and maintenance chemicals	Perform all equipment maintenance in designated areas, keep all fuels and chemicals properly containerized, and require proper disposal (treatment, pretreatment, approved sanitary landfill) of all waste products.
Direct noise from construction	Control by use of approved muffled equipment/muffling techniques and work scheduling to avoid hours of quiet for surrounding areas.

Construction Impact	Mitigation Measure
Drilling, blasting of rock if unavoidable by siting and location of facilities	Control by appropriate shielding measures, safety control and appropriate scheduling to avoid hours of quiet for surrounding areas, notify adjacent and nearby landowners.
Dust and air pollution generated by construction activities	Use of typical wetting and other dust/debris control measures, care in transferring stored fuel, use of efficient operating equipment with pollution control devices where appropriate.
Visual impact of construction equipment and construction site	Maintain construction equipment in areas that would not create visual eyesores and would minimize impact on vegetation. Fence or otherwise screen construction maintenance areas.
Increase in emission of aerial pollutants by construction equipment.	Minimize the use of internal combustion engine-powered equipment where possible. All internal combustion engine equipment should be equipped with emission control devices.
Creation of attractive nuisance and safety hazards at construction site.	Maintain construction equipment in an enclosed corporation yard. Keep curious "bystanders", especially children, away from construction areas, both during and after daily construction. During pipeline trenching operations, leave no open trenches for longer than one working day and none overnight.
Disruption of traffic	Minimize construction activity during peak hours, use traffic control, detour planning. Reroute traffic around construction areas. Provide flagmen in construction areas where traffic cannot be rerouted.

Proper design could reduce public awareness of a large sewage treatment operation on the sites and minimize any community land use conflicts.

For example, at the Naval Training Center site near Pump Station No. 2, the sewage processing operation can be screened from the public along Harbor Drive by landscaping and attractive architectural features. Its existence need not interfere with recreation uses of the Harbor Island Complex in any respect.

At the Point Loma site, land that would be graded should be properly landscaped.

Although Sorrento Valley promises to become even more intensively developed for industrial/scientific uses, operation of a treatment facility need not be in conflict with these activities. Special architectural and landscaping embellishments could render the plant almost indistinguishable from the present surroundings at Sorrento Valley.

Specific landscaping and architectural features should be explored further on a site-by-site basis as the selection process narrows down.

Compatibility With Existing Land Uses on the Proposed Sites

It is conceivable that joint usage of the proposed sites to accommodate both the existing use and the treatment plant might be accomplished with little or no sacrifice by the parties involved.

For example, at the Naval Training Center site near Pump Station No. 2, some of the athletic facilities planned for the northerly two-thirds of the site might be built above a portion of the treatment plant. The possibility of arranging planned buildings and open area at the southerly end of the site to allow dual use with a water pollution control facility may be worthy of serious consideration. Installation of athletic fields, parking and assembly areas, and Navy buildings above the sewage treatment plant would very effectively hide the municipal operation from the public.

At the Loma Portal site, if the removal of parking facilities for Air Force Plant No. 19 became a serious problem, a parking deck could be constructed over all or a portion of the site to allow for joint use of the site.

At the Midway Sports Arena site, decking could be constructed over the treatment plant to support parking areas, athletic facilities, lawns, gardens, building, etc., reducing public awareness of a large municipal operation on the property.

Compatibility with Surrounding Land Uses

Besides landscaping and good architectural design, open space buffer land could be purchased and used to form a barrier to minimize the operational effects of the plant. This mitigation measure can be implemented only where sufficient land is available.

Energy Conservation

In biological secondary treatment, the areas of largest energy consumption are pumping operations, mixing and aeration. Energy savings may be accomplished in these areas by careful attention to details in plant design and operation.

Savings in pumping energy consumption may be minimized by plant site location, while remaining compatible with land use and other considerations. In-plant savings of pumping energy may be obtained by reducing flow restriction to a minimum. Pump sizes and types should be selected for minimum energy consumption.

The mixing operations are related to the aeration process. Particular cases may allow using a blend of aeration, diffused air mixing and paddle mixing, to obtain the desired mixing at a minimum energy consumption. Tapered aeration may allow reduced aeration and therefore energy savings. The dissolved oxygen at various points in the aeration basin should be monitored to ensure a concentration sufficient for the treatment process, but not in excess of treatment requirement.

In a facility utilizing anaerobic sludge digestion, the methane gas generated represents a usable power source which should not be wasted. If air quality problems do not prevent the operation, the gas might be used either for steam generation or burned in an engine to supply energy for mixing, aeration, lighting and heating of facilities and the digesters.

Other energy savings or mitigation might be accomplished by tailoring peak energy demands to occur during off hours for overall energy consumption.

Odors

Normally odors are not a problem for a properly operated and maintained biological secondary treatment facility. In the San Diego system, H_2S is an ongoing problem because of long residence time in the piping system. The H_2S will present an odor problem. Two different methods might be used to combat the situation: 1) prevent or minimize the H_2S formation; or 2) contain the H_2S at the plant site.

Methods of preventing H_2S formation include chlorination of flows at pump stations, aeration of flows to prevent anaerobic conditions, or decreasing residence time. The change of plant site location and possible splitting of the system may reduce the residence time.

Addition of chlorine would most likely be undesirable in view of plant upset. Addition of oxygen would represent an effective solution, but at a considerable expense in capital and energy costs. In view of the pipe corrosion problem in the San Diego system however, it might prove cost effective.

Current mitigation measures of the H_2S problem involve venting of the piping system and digestion of the noxious odors by a biological media. This system has been extended to the existing treatment facility. The primary tanks are covered and vented to odor digestors. Covering of the primary tanks should be sufficient for the future system for odor control. Covering of the aeration basins, however, should be considered as a backup provision should no reduction in the H_2S generation within the piping system be accomplished. Covering of basins is undesirable from a plant operation viewpoint because of interference with visual indicators of plant performance. If chlorination is utilized in the system, care must be taken to ensure that excess chlorine is not injected and the injection is immediately before discharge.

Accident Prevention

Accident prevention involves plant operation and interceptor sewer operation. As part of the NPDES permit, accident preventive measures are required to be implemented before a permit is issued. For a facility of the size contemplated, the desirability of standby power generation should be investigated. A fully-qualified operator should be on-site at all times. In the plant design, parallel systems are normally used as a matter of course, so in the event of equipment failure, treatment is not terminated. The source control program should be examined with a view to preventing illegal "slug" discharges, difficult though it would be to prevent such occurrences. Continuous monitoring for toxic materials should be performed, backed up by emergency facilities for terminating return sludge flow and providing for disposal of this sludge without contamination of digestors.

If anaerobic sludge digestors continued to be used, the tanks should have the capability to function as both primary or secondary digestors. In the event of digestor upset it would then be possible to change the flow path so as to continue digestion. Again provisions should be made for possible disposal of digestor contents in the event of undetected contamination or severe upset. Continuous monitoring of gas output, pH, alkalinity and volatile solids loading should be performed.

San Diego currently has a continuing program of sewer inspection and emergency control of sewage discharge. This program should continue. The reaches of unlined concrete interceptor pipe should be carefully examined and remedial measures considered should these reaches continue to be used for raw sewage.

The emergency plan for handling large emergency sewage spill should be examined and possible drills conducted.

Measures to Minimize Secondary Impacts

Air Quality Related Measures

The San Diego Air Quality Planning Team has identified numerous measures which could reduce air pollution levels in San Diego County (see Table II-11). Those tactics which were adopted by CPO and the APCD are briefly summarized in Table VIII-2. The current status of actions implementing these tactics is summarized is summarized in Table VIII-3.

The Regional Transportation Plan discussed earlier in this report endorses transportation systems which provide alternatives to automobile travel, would reduce the region's energy requirements and provide improvements in air quality. The alternative systems include fixed-guideway transit, bus improvements, bicycle lanes and automobile park and ride. Specific actions that have been accomplished in the San Diego region in the past or are recommended for implementation in the 1977 Transportation Systems Management Element include:

- Bicycle Systems - A Five-Year Bicycle Route Program (FY78-82) includes improvements totalling about $5.3 million along 205 miles of regional bicycle routes. A 22-mile Bay Route Bikeway has just received state approval and will run from Coronado through Imperial Beach, Chula Vista, National City, and into downtown San Diego. The system also includes bus bike rack carriers.

Table VIII-2

SUMMARY OF ADOPTED RAQS TACTICS

TACTIC	
Designation	Description
A2	General aviation aircraft evaporative controls on new models in 1980.
P1	Dry cleaners to implement product change/ controls on equipment to give 50% RHC reduction by 1980.
P2	Surface cleaning products RHC emissions reduced 50% by product change, alternate process or capture of vapors.
P3	Architectural surface coatings (paints) shift to non-reactive bases and/or control of exhaust vapors. RHC reduction targets: 1980 = 25%, 1985 = 60%, 1990-2000 = 90%.
P4	Industrial surface coatings (paints) shift to non-reactive bases and/or control of exhaust vapors. RHC reduction targets: 1980 = 30%, 1985 = 60%, 1990-2000 = 90%.
P7	Vapor recovery equipment effectiveness improved to 95% by 1985. Extends control rules to cover certain exempt facilities.
P9	Gasoline volatility reduction during summer months from FEVI 12 to FEVI 10. If implemented, there is less RHC reduction from evaporative control tactics.
M1	Inspection and maintenance of on-road motor vehicles to give 7% reduction in RHC emissions below nominal levels for pre-1975 model light-duty vehicles and all heavy-duty vehicles, motorcycles and Mexican registered vehicles.
M3	California light-duty vehicle emission standards and adopted 6 gm evaporative standard for post-1977 model years.
M4	California 5/25 exhaust emission standard and evaporative standard for heavy-duty vehicles for post-1977 model years.
M5	California street motorcycle emission standards three-phase reduction regulations of 10 gm/km HC in 1978, 5 gm/km in 1980, and 1 gm/km in 1982 and after.
M7	Additional evaporative controls on light-duty vehicles meeting a 2 gm HC standard beginning with 1980 model year.
M9	Additional evaporative emission controls on light-duty vehicles meeting a 1 gm HC standard beginning with 1982 model year.
M14	Emission standards for off-road heavy-duty vehicles same as 5/25 standard for on-road class beginning with 1980 models.
T1 (modified)	Reconcile differences between Regional Comprehensive Plan, Regional Transportation Plan, and local general plans.
T2	Maximum carpools/ vanpools plus incentives. Assume implementation by 1980 and 7% VMT and 5% trip reduction for light-duty vehicles.
T3	Communication substitutes and home goods delivery to reduce need for personal travel. VMT and trip reduction targets for light-duty vehicles: 1980 = 2%, 2000 = 10%.
T7	Maximum bicycle system in addition to that included in tactic T-1. Includes adopted regional system, local networks, employer incentives, bike-and-ride, and storage facilities.
X2	Home utility engines RHC emissions reduced by controls and/or shift to low polluting power sources with 50% reduction from new equipment by 1980.

Source: San Diego Air Quality Planning Team, 1976a; Comprehensive Planning Organization, 1976a.

Table VIII-3

STATUS OF ADOPTED RAQS TACTICS

Tactic	Lead Agency	Status
A2	EPA	EPA/APCD discussions and research on control of light aircraft fuel dumping.
P1	APCD	Task Force working. Draft regulations due in October 1977.
P2, P3, P4	ARB/APCD	ARB ORGSOL Regulations Study Group actively proceeding. Proposed rule for architectural coatings under review.
P7	ARB/APCD	Standardized fill pipes required for 1978 and later model years.
P9	ARB	ARB research and study continuing.
M1	ARB	ARB proceeding slowly; San Diego initiative high to assume responsibility for stepped up timetable.
M3, M4, M5	ARB	ARB regulations basically on target.
M7, M9	ARB	ARB rules partially effective; no action on final 1 gm/test standard.
M14	ARB	Research being conducted
T1 (modified)	CPO	Population/population distribution negotiation begun; no action resolving transportation plans.
T2	CPO	Consultant hired.
T3	CPO	Consultant hired; workshops.
T7	CPO	Consultant hired.
X2	ARB	No Action.

Source: Mike Sloop. San Diego County Air Pollution Control District (pers. Comm.).

- Carpooling - By January 1977, over 19,000 applications had been processed using the commuter matching services of Commuter Computer, the Regional Ridesharing Program. In the first 18 months of operation ending December, 1976, about 2,500 persons joined or expanded a carpool as a direct result of the Commuter Computer program.

- Subscription Bus Services - There are eight buses currently providing subscription bus services to major employers within the region. During FY 1978, Commuter Computer will actively promote subscription bus, vanpooling, and park-and-pool programs throughout the region.

- Dial-A-Ride Operations - There are four public dial-a-ride operations in the San Diego region. The Cities of El Cajon and La Mesa each provide services under contract with the Yellow Cab Company. The County provides modified service between La Mesa/El Cajon and the unincorporated communities in the East County area. And San Diego City Dial-A-Ride operation provides demand-responsive service to the handicapped and elderly.

- Park and Ride Lots - Two lots with capacity for 125 to 150 cars each are under development at Mira Mesa and La Mesa. Additional lots are planned for the future.

Assessment of the Adopted RAQS Tactics.

Reactive Organic Gas Emissions. The documents prepared by the San Diego Air Quality Planning Team included an evaluation of the effectiveness of the identified emission reduction tactics. These evaluations have been used for this EIS in conjunction with the Series IV-based emissions forecasts. The emission reduction tactics adopted by CPO and the APCD are expected to reduce reactive organic gas emissions for various major emission source categories as shown in Table VIII-4. Any assessment of the effectiveness is complicated by the fact that the City of San Diego has not adopted tactic T1 (modified).

Comparing Tables VII-19 and VIII-4, it can be seen that for the San Diego Air Basin, the adopted RAQS tactics will not produce the emission reductions needed to attain the federal oxidant standards. This conclusion applies regardless of the air quality assessment procedure used (linear rollback or

Table VIII-4

ROG EMISSIONS REDUCTIONS EXPECTED FROM ADOPTED RAQS TACTICS

Emissions Source Category	Percent Reduction in Forecasted Emissions		
	1985	1990	1995
Process loss	51.73%	67.90%	68.72%
Combustion	0.0%	0.0%	0.0%
Motor vehicles	54.30%	58.56%	57.50%
Aircraft	7.21%	14.96%	23.49%
Miscellaneous	24.06%	47.50%	47.73%
TOTAL REDUCTION	48.75%	59.56%	60.29%

NOTES:

Adopted RAQS tactics identified in San Diego Comprehensive Planning Organization, 1976a (see Appendix B of this EIS).

Emissions reductions summarized from detailed analysis presented in Table A of Appendix I.

These values presented in this table assume that tactic T1 (modified) will be implemented, and that its effectiveness will be the same as that estimated by the Air Quality Planning Team for the original tactic T1. Motor vehicle ROG emissions reductions from tactic T1 are estimated at 3.31 percent in 1985, 3.38 percent in 1990, and 3.77 percent in 1995. Overall ROG emissions reductions due to tactic T1 are estimated at 1.37 percent in 1985, 1.29 percent in 1990, and 1.35 percent in 1995.

ROG: Reactive Organic Gas

"Appendix J" procedures). Assuming that the percentage reductions calculated for the Air Basin also apply to the project service area, a slightly different situation is apparent. If the linear rollback procedure is used for air quality analysis, then the adopted RAQS tactics will produce the emissions reduction required to attain the federal oxidant standard in 1990, with maintenance of that standard through 1995 (assuming that tactic T1 (modified) is implemented by the City of San Diego). If EPA's "Appendix J" procedure is used for the air quality analysis, then the adopted RAQS tactics will fail to produce the emissions reduction required for attainment of the federal oxidant standard. Table VIII-5 summarizes this situation.

Carbon Monoxide Emissions. The documents prepared by the San Diego Air Quality Planning Team did not address the extent of carbon monoxide emissions reduction expected from the various identified emission control tactics. As shown previously in Table VII-19, 10 to 20 percent reductions from projected CO emission levels are required to indicate attainment of the 8-hour federal CO standard. Several of the adopted RAQS tactics (M1, M4, M14, T1, T2, T3 and T7) will produce CO emission reductions. As shown in Appendix I, these tactics provide ample CO reduction potential. Cumulative CO reduction attributable to these tactics is estimated to be 24 percent by 1985, 33 percent by 1990, and 39 percent by 1995.

Additional Measures For Oxidant Reduction. The preceding analysis indicates that measures beyond the adopted RAQS tactics must be implemented if the federal oxidant standard is to be achieved by 1985. The RAQS report (San Diego Air Quality Planning Team, 1976a) identified several tactics as "backup" tactics for "Strategy B". These backup tactics include accelerated implementation of certain measures already adopted by CPO and the APCD, as well as additional tactics not yet adopted for implementation. Table C of Appendix I presents an estimate of the effectiveness of the designated backup tactics. The additional ROG emission reduction provided by these backup tactics is estimated to be 9.96 percent in 1985, 2.67 percent in 1990, and 3.02 percent in 1995.

These additional tactics, if implemented along with the CPO/APCD-adopted tactics, are still insufficient to indicate attainment of the federal oxidant standards for the Air Basin during the period through 1995 (see Table VIII-5). These additional reductions within the project service area would indicate attainment of the federal oxidant standards in about 1985 with maintenance of the standards through 1995 only if the linear rollback procedure was accepted.

Table VIII-5

ADDITIONAL ROG EMISSIONS REDUCTION REQUIRED FOLLOWING IMPLEMENTATION OF THE ADOPTED RAQS TACTICS

Geographic Area	Air Quality Analysis Procedure	Required Additional ROG Emissions Reduction					
		1985		1990		1995	
		%	Tons	%	Tons	%	Tons
Air Basin	Linear rollback	14.65	30.0	4.84	10.2	5.21	11.3
	FR Appendix J	34.95	71.6	24.54	51.7	24.31	52.9
Metro service area	Linear rollback	10.05	16.3	0.04	0.1	0.21	0.4
	FR Appendix J	28.15	45.5	14.74	24.3	14.61	24.7

NOTES:

Preliminary Series IV development patterns assumed. Implementation of tactic T1 (modified) assumed.

Additional reactive organic gas (ROG) emissions reduction which are needed to attain federal oxidant standard based on comparison of Tables VII-19 and VIII-2, and on emissions forecasts presented in Table VII-15. Percentage values represent percent of forecasted emissions from Table VII-15. Tonnage reductions are on an average daily emissions basis.

FR = Federal Register.

Several tactics identified in the RAQS reports were not included in any of the designated strategies or as backup tactics. The effectiveness of several of these remaining tactics will depend greatly on which other tactics are implemented. Those tactics which could be evaluated yield estimated additional ROG reductions of 3.87 percent in 1985, 3.05 percent in 1990 and 1.53 percent in 1995 (Table D in Appendix I). These estimates assume implementation of the CPO-APCD-adopted tactics and the designated backup tactics.

The analyses presented in Appendix I and discussed above indicate that implementation of all internally compatible tactics identified by the RAQS studies would yield ROG emission reductions of 62.58 percent in 1985, 65.28 percent in 1990, and 64.84 percent in 1995. Using the linear rollback procedure for analysis and assuming preliminary Series IV development conditions, these emission reductions indicate attainment and maintenance of the federal oxidant standards in the project service area throughout the 1985-1995 period, and near attainment in the Air Basin during the same period. Using EPA's "Appendix J" procedure for analysis, these emission reductions are insufficient to indicate attainment of the federal oxidant standards in either the project service area or the Air Basin (see Table VII-19).

Evaluation of the analyses presented above and in the Secondary Impacts section should recognize the data and procedural limitations discussed earlier. The ongoing air quality maintenance planning program is developing more refined data and procedures. Future analyses from that program may produce different results than those discussed above.

Preservation of Open Space

The most visible sign of population growth is the gradual loss of open land. In the San Diego region there is no overall total deficiency of open space.

According to a 1974 analysis conducted by CPO in the county as a whole, there are almost 110,000 acres of land which have little or no open space value and which are to be served by water and sewer facilities, and are therefore available for development. This is less than the 104,800 acres within the county required to accommodate development projected in the Series IV 1975-1995 forecast. However, the distribution of open space is poor within the urbanized western one-third of the county. In some subregional areas, there may be difficulty in accommodating the projected growth within that particular area without the loss of some open space land; there may be a need to redirect urban growth, in part by withholding the provision of water, sewer and other public facilities, away from these areas of high open space value.

As a part of the Comprehensive Plan, CPO has recognized the desirability and the need to identify open space areas for preservation as the region's urbanized area continues to expand. Recommendations for defining open space requirements, redirecting urban growth and implementing programs for open space preservation are stated in CPO's Open Space Plan and Implementation Program (April 1974).

The plan establishes the following open space categories: state parks, national forests, regional parks, agricultural lands, public safety, natural resource areas (i.e. wetlands, lagoons, reservoirs, wooded areas, plant and wildlife habitats, and coastline).

The general policy intent of the CPO plan is stated on page 63 of the Open Space Plan and Implementation Program as follows:

> Maximum use should be made of devices which can help condition the timing and location of growth. Foremost among these are water and sewer extensions and the placement of major transportation arterials and facilities. They should be utilized by the CPO to their fullest extent to divert the pressures of urbanization from the open space areas designated in this plan.

Other CPO policies which apply to all types of open space include:

Priorities should be set for the preservation of all open space areas based on multiple use potential, development pressure and proximity to high density urban development.

The interdependent nature of natural factors in the ecosystem should be emphasized both in formulating and implementing an open space system.

Different approaches should be used for preserving lands which require public access and those which do not.

Property taxation should reflect the influence of open space zoning regulations on property values.

The state and federal governments should acquire privately owned inholdings in state park and national forest areas when and where appropriate.

The conversion of military land with recreational value to some other form of public ownership and use should be encouraged when and if that land becomes surplus for military purposes.

Public access rights should be obtained to land in public ownership that is open in character and has value for recreation.

All land in public ownership that is open in character and has other identifiable values should be retained in public ownership.

Public agencies which own open space land should permit only those land uses which are appropriate to the quality of the land's open character.

Priorities for the acquisition of the proposed regional parks should be based on proximity to demand and recreational acreage deficiencies.

Development of steep slopes and flood plains should be limited or precluded by regulation.

Scattered development in small areas of flat land surrounded by rugged terrain should be prevented. This can be accomplished in part by discouraging the extension of water and sewerage service to these areas.

Whenever possible, wetlands, lagoons, reservoirs, wooded areas, rare and unique plant and wildlife habitats, and the coastline should be preserved through open space zoning by creating a natural resources overlay zone.

Open space structure areas should be designated (a) which link other open space areas together, (b) which form islands within open space areas and are not suitable for isolated development - as well as other open space areas which shape urban form, and (c) which border open space, that if developed, would destroy the open character of the adjacent natural areas. This should be done by the CPO and its member jurisdictions as local and regional growth policies are formulated. Implementation techniques will vary according to which of the above functions the open space structure area is serving.

Land designated for staged urban growth to 1995 should be released for development in increments to make possible the realization of compact and efficient urban development.

Local governments must initiate much of the needed action to realize this manner of growth. Development can be timed by designating some areas for immediate urbanization and some as holding zones, to be released at a later date. Devices used to maintain these holding zones include large lot zoning, limitations or moratoriums on the issuance of subdivision and building permits, and open space zoning.

Open space acquisition also should be staged over a period of years, in concert with the region's staged transportation and water and sewerage plans and programs.

Areas not suitable for urban development due to a lack of public facilities should remain open. Premature and large scale second home subdivisions should be discouraged in these areas.

As a regional council of governments the CPO is mandated by the U.S. Department of Housing and Urban Development (HUD) to prepare an open space plan and an action program to implement the plan, including a regional capital improvements program. As a metropolitan clearinghouse, the CPO must evaluate all federal grant applications made by the local jurisdictions. Included are applications for open space projects, as well as other urban facilities. CPO also plays a role in reviewing and commenting upon the adequacy of environmental impact statements for federal and state assisted projects and some large scale local public and private projects. CPO is also the agency responsible for disbursing state funds for transportation projects and programs in the San Diego region.

While CPO can play a major role many implementation programs rely heavily on effective regulation which can be dealt with only by local and county governments in the San Diego region and by the state and federal government. Implementation measures which apply specifically to local jurisdictions are noted on pages 77 to 84 of the Open Space Plan and Implementation Program.

Preservation of Agricultural Lands

Although no prime agricultural land preservation legislation is yet in effect, it appears likely that such a law will be passed, probably within the next three years, thereby adding to municipal and county efforts in this area the weight of state law.

An agricultural lands subelement has been prepared as an integral part of the CPO Open Space Plan discussing the values of saving agricultural lands and various ways in which this may be done. The CPO, as well as many of its constituent jurisdictions, has adopted policies for preserving agricultural land. The following goal and its accompanying objectives have been preliminarily adopted by the CPO Board of Directors as part of the Regional Goals Program:

Preserve as open space lands the agricultural crop lands of the region.

To give equal protection to these lands regardless of the size or proximity to urban areas.

To encourage appropriate agricultural uses on additional open space lands not needed for public recreation use or resource preservation.

Preserve from nonagricultural development the following areas: (1) all high quality agricultural lands (per Crop Suitability Ratings, Soil Interpretation Study); (2) existing and future appropriate agricultural preserves; (3) existing and future appropriate quasi-public and public lands with farming leases; (4) special situations; and (5) existing and appropriate future farming operations not committed to urbanization by public policy plans.

Specific implementation measures noted by CPO include:

Agricultural preserves should be established in areas of high agricultural value. This effort should take the form of a promotional campaign by the appropriate local jurisdictions. All landowners in the preserves should be encouraged to enter into Williamson Act contracts. The Williamson Act, also known as the California Land Conservation Act of 1965, is a contractual agreement entered into by a landowner and county which restricts the use of the property for any purpose other than agriculture. The owner does not receive any direct payment from the County in consideration of the use restrictions imposed. The advantage that will accrue to the owner is a result of the effect upon the assessed value of the property which reflects the restrictions on use.

The purchase and leaseback of land for agricultural use should be carried out for those areas which are of high agricultural value and are experiencing urban development pressure.

Provision of Community Services and Related Fiscal Impact

As explained in Chapter VII, impact of anticipated growth in the San Diego region on the tax burden of local residents and the quality of public services is an issue of increasing concern. Providing public services to new users so as to not adversely affect the quality, quantity and cost to existing users is part of the on-going growth management activities of CPO, local governments and special districts.

CPO in cooperation with local jurisdictions has proposed a growth management policy and fiscal impact study with the objective that local government can provide an array of public services at the least cost possible. This approach is described in the CPO publication entitled Managing Urban Growth and Public Facilities (July 1976).

The concept of growth management makes the realization of this objective possible by staging or timing residential and commercial development so that existing public service capacities are fully utilized. This is accomplished by encouraging the infilling of vacant land where substantial levels of public service exist, and the sequential development of land contiguous to the urbanized area. In this way, public expenditures and "leap frog" development can be minimized.

The process of formulating the growth management program begins with the establishment of a phasing or staging schedule for capital improvements. The analysis of future facilities determines where the best locations are for new urban service sites and indicates generally when those services might be needed based on the amount of growth expected and encouraged by the general plan. The staging schedule utilizes that information to explicitly detail an expenditure plan that tells when and where each future facility will be built. This schedule is reflected in a 15 to 20 year capital improvements program (CIP) or in series of 5 or 6 year CIP's. The CIP reflects the knowledge gained from the analysis of future facilities as well as the fiscal constraints previously mentioned. The CIP's are not "wish" documents, rather they reflect a genuine financial commitment by the community. That commitment is based on the idea that those expenditures are required in that particular sequence to achieve the community's preferred urban form and quality of life. With the completion of each CIP another tier of urbanizable land is added. A tier is added with each CIP until the area has reached its preferred end state.

Enforcement Policies and the Necessary Administrative Procedures. With the adoption of the staging or phasing schedule and the CIP process, the implementation of the growth management program is near. The last remaining task is to prepare enforcement policies and the necessary administrative procedures to achieve those policies. This step will require policy makers to prepare guidelines for their agency staffs to follow while implementing the staging schedule. These guidelines will detail to the public the exact procedures and rules that will be followed in the development of the community for the next 15-20 years. They will explain appeal procedures for those who wish their land developed at a differing rate from the one in the adopted CIP. In addition, the city may offer incentives to encourage development where desirable. With the adoption of these policies and procedures the growth management plan is complete and implementable. The only further task is to periodically update and refine the plan as significant changes in the nation, state or community take place. Only in this way will the growth management program remain realistic and viable and allow the community to stage the construction of capital facilities so that growth can be directed to those areas of least public cost.

Presently, as part of the process described above, CPO is conducting a regionwide fiscal impact study with the help of the cities, county, school districts, and other special districts. The basic approach will be to translate projected changes in population and land use into changes in public costs and revenues. An intermediate step will be to identify the need for public services and facilities. A comparison of projected costs and revenues will suggest changes in tax burden necessary to accommodate growth.

This fiscal impact study will be useful in several ways. In addition to addressing the tax implications of growth it will assess the ability of local agencies to coordinate land development with the provision of services and facilities. This will be a key input to the Areawide Water Quality Management Plan (208). While the Areawide Plan will focus on the need for water and sewer facilities, it will also evaluate the future capacity of agencies to finance these facilities while maintaining other essential services.

The fiscal analyses will also assist LAFCO in conducting the Spheres of Influence Program, which has great potential to shape the future of the region. The sphere lines will be used by all jurisdictions to better coordinate the provision of urban services with the expected new levels of population growth through 1995.

Protection Against Geologic and Fire Hazards

Judicious siting of residential, commercial, and industrial developments will minimize potential hazards. Compliance with all applicable federal, state, and local regulations will greatly reduce the potential for damage from these hazards. Uniform Building Code requirements are minimum acceptable standards. Potential mitigation measures are listed below:

- Landslide/landslide-prone areas - avoid or correct all slope stability problems.
- Erosion activity - Implement grading, landscaping and drainage ordinances, require an erosion control plan. Avoid construction in areas affected by coastal erosion.
- Expansive soils - Recognize existence of problem and engineer foundations properly.
- Fault displacement - Resite.
- Subsidence - Engineering solutions dependent on type of subsidence (groundwater withdrawal, oil and gas withdrawal, hydrocompaction).
- Earthquake shaking - Conformance with Uniform Building Code.

- o Tsunami - Locate facility in areas of low hazard potential (specific coastal stretches more protected or inland).
- o Loss of mineral resources - Zone for specific avoidance of mineral resource areas.
- o Fire - Require a fuel management study/plan for developments in high fire hazard areas (California Division of Forestry, 1973).
- o Flooding - Strict enforcement of flood plain zoning.

Mitigating Water Quality Impacts

The mitigation measures suggested in Table VIII-1 to be used during facilities construction can also apply to construction practices for any development. An erosion control plan should be prepared and instituted for any development which has the potential for accelerating erosion and sedimentation above normal levels. Such a plan should contain features (if not already in city and county ordinances) such as:

- o Install culverts, side drainage ditches, waterbars (checks and drains) in all access roads.
- o "Dress" temporary roads to remove water-carrying channels.
- o Revegetate cut and fill slopes of roads and sites, rectify machine compaction.
- o Stockpile topsoil and use as part of revegetating program.
- o Stabilize disturbed soils with grass cover and follow up with vegetation with native species on those areas which will experience only temporary use.
- o Mulch, judiciously fertilize and seed to restore grass cover.
- o Slash and other vegetation waste materials should be used for mulch or placed in a landfill.
- o End haul excess cut material instead of side casting (road construction).
- o Borrow areas -- contour and revegetate or prepare for beneficial use (fish, wildlife).
- o Excess cut material -- grade to conform to adjacent land.
- o Use of detention/sedimentation basins.
- o Etc.

Other mitigative, protective or remedial measures, particularly those related to non-point sources of pollution are being researched in CPO's 208 study (see earlier discussions of CPO for further information). Pollutants in storm drain runoff are currently being studied by EPA, U. S.

Geological Survey, and other agencies. A bill is before the California Legislature which would provide for waste oil "recycling" centers where individuals could dispose of used automotive oil rather than pouring it down the nearest storm drain

Mitigating Cultural Resource Impacts

The mitigation measures given in Table VIII-1 related to historical and archeological resources apply to residential, commercial or industrial developments. No specific cultural resources regulations have been enacted by San Diego city or county governments; state and federal codes are relied upon for legal requirements. Stronger, more definitive ordinances could be developed and enforced by local city and county governments related to needs for reconnaissance surveys, protective/extracline techniques, financial responsibilities and other aspects of protecting cultural resources from encroaching development.

Mitigating Natural Resources Impacts

Mitigation techniques listed in Table VIII-1 can be applied to construction of residential, commercial or industrial development. Development of natural resource lands produces a permanent loss of vegetation and wildlife habitat and the wildlife it supports. Remaining wildland areas can be improved in wildlife value (more available food, water or cover) so that their carrying capacity might be improved as a mitigation measure. For the most part, however, when natural resources areas are lost to development, the vegetation and wildlife losses are not mitigated. Protection of wildland areas by public purchase, open space zoning, etc. protects those lands chosen; such action does not mitigate for those lands already lost to development. Reduction of in-roads of development into wildlands by infilling new development in existing urban areas (as opposed to development at urban fringes) will help to diminish potential natural resource losses.

Techniques to Mitigate Noise Impacts

Increasing ambient noise levels can be mitigated by development and enforcement of noise ordinances at the city or county level. Such ordinances are in force in the San Diego area. Judicious zoning and the use of noise-attenuating devices along transportation corridors can help to reduce the health hazards and annoyance associated with increasing ambient noise levels in urban (urbanizing) areas.

IX. UNAVOIDABLE ADVERSE IMPACTS

Each of the alternative wastewater systems and their components would create unavoidable adverse impacts. These impacts have been described on preceding pages, and mitigation measures capable of reducing the magnitude of the impacts have been suggested where appropriate. The following table summarizes the direct and indirect unavoidable adverse impacts of construction and operation of the systems. The listing of unavoidable adverse impacts contains all adverse environmental effects which cannot be avoided if the proposal is implemented, including those impacts which can be reduced to an insignificant level but not eliminated.

Summary of Unavoidable Adverse Impacts

Impact

CONSTRUCTION

1. Creation of local noise, dust and aerial emissions along interceptors and at plant site.
2. Creation of visual disruption at construction sites.
3. Loss of vegetation and wildlife habitat to new facilities.
4. Loss of non-mobile wildlife species on construction sites.
5. Loss of agricultural land to new facilities.
6. Loss of vegetation and wildlife habitat due to spoil disposal.
7. Alteration of topography.
8. Changes in natural drainage patterns.
9. Alteration and erosion of soils resulting from excavating, grading and backfill.
10. Potential for degradation of surface and groundwaters due to spills of fuel and maintenance chemicals.
11. Increased fire hazard potential.
12. Potential for loss of archeological/historical resources.

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Impact

13. Creation of nuisance and safety hazards.

14. Disruption of traffic and commercial and residential activities.

15. Consumption of energy and materials.

16. Potential for increased turbidity.

OPERATION

1. Increase in energy and chemicals required for wastewater collection, treatment and disposal.

2. Increase in the volume of sewage sludge produced through wastewater treatment.

3. Increase in the cost of providing wastewater treatment service.

4. Increase in ambient noise levels in vicinity of treatment plants and pumping stations.

5. Possible odor problem at plant sites from treatment plant upset and along interceptor routes at trunk line vents.

6. Possible odor problem at sludge disposal site(s).

7. Possible public health hazard related to heavy metals, toxicants and pathogenic organisms found in sludge that may be carried into groundwaters or contained in soil amendments produced from dewatered sludge.

8. Visual impact of treatment plant facilities.

9. Discharge of potentially toxic heavy metals and organic substances to the ocean.

10. Loss of flora and fauna at sludge disposal site(s).

GROWTH RELATED

1. Increased pressure on local water supplies.

2. Conversion of open space and agricultural land to urban uses.

Impact

3. Increased pressure on public services and facilities (schools, fire and police protection, highways, etc.)

4. Increases in urban runoff and erosion which affect water quality.

5. Increases in stationary source emissions and vehicular traffic emissions with subsequent degradation of air quality.

6. Increased demands on local energy and natural resource supplies.

7. Potential loss of cultural, scientific and educational resources due to urbanization of open space lands.

8. Loss of vegetation and wildlife on urbanized lands.

9. Increased ambient noise levels in urbanizing areas.

X. LOCAL SHORT-TERM USES OF THE ENVIRONMENT VS. MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

All of the alternative wastewater treatment and disposal systems, including no action, involve trade-offs between beneficial and adverse impacts. Ultimate selection of the best alternative is intended to result in achieving the maximum beneficial effect at the lowest possible environmental, social and monetary cost.

The conversion of the present primary wastewater treatment system to a secondary system is needed to comply with the Federal Water Pollution Control Act (PL 92-500), which mandated secondary treatment in publicly-owned treatment plants by July 1, 1977. The San Diego Metropolitan System is not in compliance with the law or with their NPDES permit issued by the California State Water Resources Control Board. The basic tenant of the federal law in requiring secondary treatment was to reduce the waste loading of receiving waters. Such a consideration is for the long-term productivity of such waters.

Implementation of secondary treatment will greatly (84 percent at 200 mgd) reduce BOD and suspended solids in the discharged effluent. More heavy metals will be discharged when the secondary system is at capacity (200 mgd) than are discharged today, but the quantity will be less than if the system had remained with just primary treatment and expanded to 200 mgd. At 200 mgd the discharge will be characterized by reduced BOD; suspended solids; grease, oil and floatables; organic material; and toxic pollutants. Such conditions will decrease turbidity and reduce biostimulation and biomass. Reduced biostimulation and biomass will be compensated by greater phytoplankton productivity and ultimately by greater productivity in the rest of the food web. Improvements in effluent quality and reduced mass emission of toxic wastewater constituents will lessen the potential for disease among marine organisms. Secondary treatment will reduce viral counts by a factor of 2×10^2 and bacterial counts by a factor of 10^3.

Secondary treatment will greatly increase sludge production and compound sludge dewatering and disposal problems. Fiesta Island at some future date may be insufficient to handle all the sludge produced or may be unavailable as a dewatering site. Use of the land as a depository for sludge is not without public health and environmental concerns.

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The same heavy metals and other toxic substances not wanted in ocean discharges because of their effects on biological organisms are in part transferred to sludge for disposal on land. It is now considered that land systems can more effectively handle the pollutants found in wastewater than can ocean systems. Since all the ramifications of land disposal of sludge have not been researched, land systems have been "trade-off" for ocean systems for the time being.

The increased service area populations to be supported by the regional wastewater system will permanently displace additional open space and agricultural land. Especially significant is the potential loss of productive agricultural land in South Bay areas. The loss of prime agricultural land is not mitigable in that high quality soils are a finite resource and cannot be created in other areas by human manipulation. The added populations will also require building material and energy resource inputs in the form of dwellings, roads, utilities and community service, and a whole variety of service-oriented structures that accompany new populations. Increasing demands on the local water supply brought on by population increases will affect the long-term productivity of existing surface and groundwater resources, both within and outside the San Diego area. The projected increases in aerial pollutants associated with regional growth will make attainment of health-related air quality standards even more difficult.

The development of another ocean outfall (in the South Bay) may reduce the chances for reclamation. Once the outfall is constructed, support and financing for reclamation facilities may be looked upon as redundant means of disposing of treated effluent. Reclamation will require treatment in addition to secondary treatment and a distribution system. Until reclaimed water costs become competitive with potable water costs (due to law, policy, and quantity changes) reclaimed water systems will be seen as a "frill" compared to continued ocean discharge.

The "no action" alternative would continue the unlawful disposition of primary treated effluent to the ocean; a short-term use of the environment.

XI. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Minor and major irreversible and irretrievable commitments of both renewable and non-renewable resources will occur if any of the proposed projects are implemented. Construction will irretrievably commit mineral resources in the form of aggregate; pipe, treatment plant structures; excavated and displaced soils and vegetation; and petroleum fuel sources. A considerable amount of man-hours and energy resources will also be required. Specific commitments depend on the alternatives chosen and the mitigation measures implemented. The land uses and land areas displaced by treatment and disposal facilities will be lost for at least the lifetime of the facilities. During project operation, man-hours and chemical and energy resources will continue to be utilized. Development of a treatment facility in the South Bay in addition to the development of a central city site will greatly increase the commitments of resources for construction and operation of the facilities.

The new wastewater system is designed to accommodate the growth anticipated by local government agencies. If the other necessary elements of public service infrastructure are made available (i.e., water supply, roads, electrical power, etc.), growth will probably proceed within the project service area as described in the Secondary Impacts section of this report. Open space and agricultural land on the urban fringes would be irreversibly converted to suburban subdivisions. The loss of Tia Juana River Valley's prime agricultural land is of special concern. Additional open space and valuable natural land could be lost to new subdivisions in the South Bay area particularly if a treatment facility is located there. Agricultural lands and wildlands with value as croplands, wildlife habitat and scenic relief would be irreversibly committed to residential use if these areas are developed. The Tia Juana Estuary could be degraded by upstream developments both in the United States and in Mexico.

XII. CONCLUSIONS

Selection of an Alternative by City of San Diego

On July 20, 1977 the Council of the City of San Diego resolved:

> "That with respect to Environmental Impact Report No. 77-01-14, adopted by Resolution No. 218889, the Council does hereby select Alternative 4.
>
> BE IT FURTHER RESOLVED, that the City Manager be and he is hereby authorized to apply for a Federal Grant from the Environmental Protection Agency to accomplish the purposes set forth in Alternative 4.
>
> BE IT FURTHER RESOLVED, that the staff is hereby directed to proceed with the hiring of a Consulting Engineer under the Federal Grant Step II funding, with provision made in that contract to design Alternate 1 in the event the law is subsequently amended.
>
> BE IT FURTHER RESOLVED, that the staff is hereby instructed to continue its efforts of investigation, studies and research into wastewater reclamation and recycle, stressing the need for resource recovery, energy savings, energy generation, and food production, incorporating innovative devices and keeping the Council appraised of efforts in this direction."

The full text of this resolution (218890), resolution 218889 (adoption of the EIR) and resolution 218891 (findings of mitigation, feasibility, and project alternatives) are included as Appendix L. It is concluded from the city's resolution and EIR that "Alternative 4" identified in this resolution is actually Choice 4 in the EIR and Recommendation 4 in the Facilities Plan Addendum and that "Alternative 1" in the resolution is really Choice 1/Recommendation 1. The city's proposed project programs are summarized below:

Recommendation/ Choice	Principal Features and Phases
1	Continue primary treatment at Pt. Loma with capacity increases to 200 mgd by year 2000. Provision of a separate system for Tijuana Phase I - increase capacity to 150 mgd Phase II - increase capacity to 200 mgd

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Recommendation/ Choice		Principal Features and Phases
4		Provision of secondary treatment in a "split" system, 100 mgd in the South Bay area and 100 mgd in the north (Pt. Loma and a central city site).
	Phase I -	Construct 70 mgd biological secondary facility in the South Bay area and an ocean outfall; supply 40 mgd facility for Tijuana Pt. Loma - continue primary treatment
	Phase II -	Conversion of Pt. Loma to 45 mgd biological secondary; construction of a 55 mgd biological secondary plant in central San Diego Additional 30 mgd expansion of South Bay plant Capacity for Tijuana increased to 90 mgd

Both of these recommendations contain the same provisions for sludge disposal; augmentation of the existing industrial waste control program; study of salinity control and wastewater reclamation which considers "live-stream" wastewater reclamation, establishment of a water reclamation study center and ultimate wastewater recycling; and provision of wastewater treatment for Tijuana. More specifically these programs are:

- o Sludge reclamation - Reclamation of digested sludge at Fiesta Island (use of Miramar only if Fiesta Island not available). Recommendation 4 includes sludge reclamation near the South Bay facility.
- o Industrial waste control - Source control programs of EPA and State Water Resources Control Board (except attempts to reduce total chromium concentration to 0.005 mg/l).
- o Salinity control study - Investigation of the costs and technical practicality of establishing a program of salinity control in order to have water of quality

acceptable for landscape and crop irrigation and and other uses.

- Wastewater reclamation demonstration/research center - Study the use of reclaimed water in maintaining a "live-stream" in local ephemeral rivers. Study the ultimate use of reclaimed water for recycling into potable water systems.

- Tijuana - Provision of wastewater treatment for Tijuana's wastewater on the United States side of the border with return of effluent to Mexico for crop irrigation or disposal through a land/ocean outfall.

Selection of the "split system" also means the installation of a number of new interceptors whose exact locations have not been described. Although specific treatment plant sites were discussed in the Facilities Plan, EIR and EIS, specific sites were not chosen by the city in its resolution.

EPA's Concurrence with San Diego's Choice of a Conceptual Alternative

After a review of the Facilities Plan and the EIR, participation in meetings and discussions, preparation of this EIS, and analysis of the city's resolution and other information, EPA concurs with the City of San Diego in its conceptual approval of the "split system" approach (Choice 4/ Recommendation 4) to management of wastewaters in the San Diego area.

Unresolved Issues

A number of unresolved issues remain for subsequent analysis and decision making. Some of these issues include:

1. Sites for both the central city and South Bay facilities. Topical issues that require investigation are site acquistion, locating in the Tia Juana River floodplain, Coastal Commission concerns over locating in the coastal zone, loss of agricultural land, etc.

2. Location and design of over land and ocean outfall in the South Bay. The Tia Juana River Estuary is a wetlands habitat important to several federal and state designated rare and endangered animals and to a number of recognized rare and endangered plants. United States Executive Order 11990 requires federal

agencies to fully consider such habitat before the expenditure of federal funds affecting wetlands. Offshore oceanographic and biological conditions have not been adequately documented. Preliminary data indicate that the South Bay discharge could affect water quality in San Diego Bay.

3. The effects on marine flora and fauna of increased discharge of potentially toxic substances. The projected discharge of heavy metals and organic substances to the ocean has not been fully documented.

4. The capacity of other community utilities and services to accommodate the same population growth that will be permitted by capacity for 200 mgd of wastewater treatment. Once wastewater treatment is not an imminently limiting factor (present flow about 115 mgd - present capacity 120 mgd) to population growth, what other community services and utilities may restrict urban growth.

5. The effects of continued growth on air quality in the San Diego area. What additional air quality mitigation tactics must be implemented to assure attainment of clean air standards?

6. The provision of implementable mitigation and protective measures for construction and operation impacts.

7. Lack of compliance with P.L. 92-500 for (several) years beyond July 1, 1977 due to project phasing. Biological secondary treatment is not contemplated until Phase II (∿1987) at Point Loma and the unnamed central city site.

8. Continued land application of digested sludge for dewatering and for the preparation of soil amendment. Public health concerns related to heavy metals, toxic organics, viruses, etc., have not been formulated into specific public policy. Such policies may dictate alternate means of disposing of sludge.

9. Status of the negotiations between the United States and Mexico taking place at meetings of the International Boundary and Water Commission on the treatment of Tijuana's wastewater and on the Tia Juana River basin.

Detailed examination of future program features such as salinity control, reclamation/recycling, demonstration projects, etc., have not been conducted; consequently, issues related to these subjects are left for the time when these items become current topics.

As this EIS passes through the public and agency review process, some of the issues enumerated above will be resolved; but new concerns may also be raised. A number of specific concerns may not be resolved until additional studies are performed and subsequent EIRs are prepared or specific project features.

GLOSSARY*

ACRE-FOOT	A volume of water 1 foot deep and 1 acre in area or 43,560 cubic feet (325,851 gallons).
ACTIVATED SLUDGE	Used to remove sludge that has been aerated and subjected to bacterial action.
ACTIVATED SLUDGE PROCESS	The process of using biologically active sludge to hasten breakdown of organic matter in sewage during secondary treatment.
ADVERSE	An impact which is unfavorable, detrimental or harmful to man or nature.
AERATION	Bring about contact between air and a liquid by spraying the liquid in the air, bubbling air through the liquid or agitating the liquid to promote surface absorption of air.
AQUIFER	A porous, water-bearing geologic formation. Generally restricted to materials capable of yielding an appreciable supply of water.
AQUICLUDE	A geologic formation of low permeability that prevents the flow of groundwater.
AVAILABLE OXYGEN	Quantity of dissolved oxygen available for oxidation of organic matter in a water body.
AVAILABLE WATER CAPACITY	The amount of water, expressed in inches, that the soil can retain and hold available for absorption by plant roots.
BENEFICIAL	An impact which is advantageous or promotes health and well being for man or nature.
BENEFICIAL USES	Existing and potential uses which are considered desirable for human activity and for protection of the natural environment. The RWQCB employs beneficial uses to determine discharge requirements to a body of water.
BENTHOS, BENTHIC	The aggregate of organisms living on or at the bottom of a body of water (benthic - occurring on or at the bottom of a body of water).
BERM	A low mound or dike of earth or other material.

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BIOASSAY	A method of determining toxic effects by using viable organisms as test agents.
BIOCHEMICAL OXIDATION	Oxidation brought about by biological activity; results in chemical combination of oxygen with organic matter.
BIOCHEMICAL OXYGEN DEMAND (BOD)	A measure of the organic matter present in a water which can be metabolized by bacteria in a given period of time, usually five days.
BIOSTIMULATION	Increase in the growth rate of plants or animal species through the introduction of nutrient materials to the environment.
CFS	Cubic feet per second, a unit of measure of the rate of liquid flow past a given point.
CHEMICAL COAGULATION	A process involving addition of chemicals to precipitate out or flocculate undesirable suspended matter in wastewater.
CHLORIDE (Cl)	A major negative ion found in water and wastewater.
CHLORINATION	The application of chlorine to water or wastewater, generally for the purpose of disinfection.
COLIFORM BACTERIA	A type of bacteria. Its ease of identification makes it readily usable as an indicator of the presence of associated, potentially harmful bacteria (measured in MPN/100 ml [most probable number per 100 milliliters], a statistical averaging method).
COLIFORM BACTERIA (FECAL)	Coliform bacteria found in the intestines of warm-blooded animals; used as an indicator of the presence of human wastes in water.
CONDUCTANCE (ELECTRICAL OR SPECIFIC)	The ability of water to conduct electricity, measured in micromhos; conductance is related directly to the amount of dissolved salts in the water.
COST EFFECTIVE	A term used when comparing the relative economic, environmental and social costs of alternative plans or projects. For wastewater projects, EPA strives to promote the alternative that meets the project objective with the lowest combined economic, environmental and social cost (i.e., the most cost effective alternative).

DEMERSAL	Living or feeding on or immediately above the bottom of the sea.
DISINFECTION	The selective destruction of disease-causing organisms (viruses, bacteria) present in a waste stream.
DISSOLVED OXYGEN (DO)	The oxygen dissolved in water, expressed in milligrams per liter, parts per million or percent of saturation.
DISSOLVED SOLIDS, also TOTAL DISSOLVED SOLIDS (TDS)	Dissolved material found in water; in natural water it is mainly the sulfates, bicarbonates, and chlorides of calcium, magnesium, and sodium. Usually expressed as parts per million or milligrams per liter.
DIURNAL	Having a daily cycle.
DOMESTIC WASTEWATER	See municipal wastewater.
EFFLUENT	Wastewater or other liquid, partially or completely treated, flowing from a point source.
EIS	Environmental impact statement.
ENGINEERING CLASSIFICATION	Soil classification systems used by engineers to categorize soils on the basis of their physical properties.
ENVIRONMENTAL	The aggregate of biological, physical, social and cultural conditions that influence the life of an individual or community.
EPICENTER	The part of the earth's surface directly above the focus of an earthquake.
ESTUARY	A passage in which the tide meets a river current, especially an arm of the sea at the lower end of a river.
EVAPOTRANSPIRATION	Loss of water from the soil both by evaporation and by transpiration (loss of watery vapor through leaves) from the plants growing thereon.
FEDERAL SECONDARY TREATMENT EFFLUENT REQUIREMENTS	Minimum effluent quality standards for secondary treatment in terms of biochemical oxygen demand, suspended solids and pH. Standards are established by EPA.

FILTRATION	The process of passing wastewater through some medium (i.e., sand, activated carbon, diatomaceous earth, etc.) to remove suspended material.
FLOODPLAIN	Belt of low flat ground bordering a stream channel that would be inundated by stream water about once a year under natural conditions.
GEOMORPHIC	Relating to the form or configuration of the earth's surface and its genetic development.
GRANITIC	Composed of a very hard, granular, igneous rock.
GROUNDWATER	Water stored or flowing in porous materials below the earth's surface. Wells and springs are fed by groundwater.
HALOPHYTE	Any of a variety of salt-tolerant plants, able to live in salty soils.
HEAVY METALS	Metals that can be precipitated by hydrogen sulfide in acid solution, for example, gold, lead, silver, mercury, bismuth, copper.
HERBICIDE	Any substance or chemical applied to kill undesirable vegetation.
INTERCEPTOR	A main trunk pipeline that receives flow that has been collected from numerous sources.
INTERTIDAL	A coastal shore zone between extreme high and low tide marks.
LAND CAPABILITY CLASSIFICATION	A classification system grouping soils according to their potentialities and limitations for sustained production of commonly grown crops.
LANDINGS	Fish catches, usually measured in tons per year.
LEACHING	Removal of solids from soils by percolating water can include irrigation and drainage removal of salts and alkalis.
LONG-TERM IMPACT	Impacts that have an extended time frame of effect. These usually last the length of the project or beyond it, and are often associated with its operation.

MARINE SEDIMENTS	Accumulations of silts, sands, clays and gravels that have settled to the bottom in seawater environments.
METAMORPHIC	Igneous and sedimentary rocks that have been altered by tremendous pressures and high temperatures.
mgd	Abbreviation for millions of gallons per day. Mgd is commonly used to express rate of flow.
mg/l	Milligrams per liter.
MICROMHOS	Unit of electrical conductance; the omho is equal to the reciprocal of the ohm.
MITIGATION	Measures designed to reduce the intensity or extent of an impact.
MORPHOLOGY	A study of structure and form.
MPN	Most probable number; the number of organisms per unit volume that, in accordance with statistical theory, would be more likely than any other number to yield the observed test results.
MUNICIPAL (DOMESTIC) WASTEWATER	Water-borne wastes principally derived from the use of sanitary conveniences of dwellings, office buildings and industrial plants.
NITRIFICATION	The process by which ammonia present in wastewater is biologically oxidized to become nitrite; the nitrite is then oxidized by a different group of microorganisms to become nitrate. This reduces the toxicity of the effluent.
NITROGEN (N)	An element essential for plant growth; may be considered a pollutant if found in high concentrations in certain compounds.
NON-POINT SOURCES	Wasteloads which do not enter receiving waters at a commonly identifiable location, (e.g. agricultural and storm runoff).
NPDES	National Pollution Discharge Elimination System.
NUTRIENTS	Any substance or ingredient which is essential to growth; in this report it refers primarily to nitrogen and phosphorous compounds.

NUTRIENT REMOVAL	The process by which nitrates and phosphates are removed from wastewater after nitrification occurs. This is normally accomplished by the action of anaerobic bacteria that convert nitrate to nitrogen gas in the presence of a carbon source (e.g., methane). Chemical precipitation after the denitrification step removes the phosphates.
100 YEAR FREQUENCY FLOOD	A flood that has a probability of being exceeded once in 100 years, on the average.
OUTFALL	The point, location, or structure where wastewater or drainage discharges from a conduit or sewer system.
PESTICIDE	Any substance or chemical applied to kill or control pests, including weeds, insects, algae and rodents.
pH	A measure of hydrogen ion concentration on a scale of 1-14; acidity decreases from pH 1 to 7, alkalinity increases from 7 to 14. Neutral water has a pH of 7, sea water is about 8 pH.
PHOSPHORUS	A naturally-occurring element essential for plant growth, and which with nitrogen may stimulate algal blooms.
PHYSIOGRAPHIC	Relating to the physical geographic or landform character of an area.
PHYTOPLANKTON	Planktonic plant life.
PIEZOMETRIC SURFACE	Hydrostatic pressure level of water in an aquifer; and the level to which water would rise if relieved of overbearing pressure.
PLANKTON	Passively floating, drifting or weakly motile organisms in a body of water; usually microscopic.
ppm	Parts per million. A measurement now being replaced by mg/l. 1 ppm of any substance in water equals: 2.7 lbs. per acre-foot 0.0038 gram per gallon 0.0284 gram per cubic foot

PREDATION	A mode of life in which food is primarily obtained by killing and consuming of animals.
PRIMARY TREATMENT	The first major treatment in a wastewater treatment works, usually sedimentation. The removal of a substantial amount of suspended matter but little or no colloidal and dissolved matter.
RECLAIMED WASTEWATER	Wastewater processed for reuse.
RIPARIAN	Relating to or living or located on the bank of a natural watercourse.
SALINE, SALINITY	The relative concentration of salts in water. Sea water contains about 20,000 ppm chloride with a salinity of 35,000 ppm. Water is termed brackish if salinity ranges upward from 1,000 ppm of dissolved salts.
SECONDARY TREATMENT	The treatment of wastewater by biological methods after primary treatment by sedimentation.
SEDIMENTATION	The process of subsidence and deposition of suspended matter carried by wastewater or other liquids by gravity; usually accomplished by reducing the velocity of the liquid below the point at which it can carry suspended material.
SEPTIC	A toxic condition resulting from the spread of bacteria or their products.
SESSILE	Attached to the substratum; anchored.
SETTLEABLE SOLIDS	Suspended solids which will subside in quiescent water, sewage, or other liquid in a reasonable period, usually a one-hour time period.
SEWAGE	The spent water of a community (this term now being replaced by wastewater).
SHORT-TERM IMPACT	Impacts that have a time frame of effect that is generally less than one year; often related to construction effects.
SLUDGE	The solids separated from wastewater during processing, or deposits on bottoms of streams or other water bodies.

SOIL ASSOCIATIONS	A group of defined taxonomic soil units occurring together in a characteristic pattern over a geographic region.
SPECIFIC CONDUCTANCE	A measure of the resistance of a solution to electrical flow; resistance decreases as content of ionized salts increases.
SUBTIDAL	Coastal zone seaward of the extreme low tide line.
SUSPENDED SOLIDS	Solids that either float on the surface of, or are in suspension in water, wastewater, or other liquids.
SYNERGISTIC	Cooperative action of discrete agents such that the total effect of their actions is greater than the sum of the effects taken independently.
TDS	See Dissolved Solids.
TERTIARY TREATMENT	Wastewater treatment beyond the secondary level; usually involves additional filtration, chemical coagulation and sedimentation.
TOPOGRAPHY	The configuration of a surface, including its relief and the position of its natural and man-made features.
TOXIC SUBSTANCES (TOXICANT)	A substance that kills or injures an organism through its chemical or physical action or by altering its environment; for example cyanides, phenols, pesticides, or heavy metals.
TOXICITY	The quality or degree of being poisonous or harmful to plant or animal life. Can manifest itself in either acute or short-term effects or chronic, long-term effects.
TURBIDITY	The reduction of transparency of a liquid due to the scattering and absorbing of light by suspended particulates.
UNDERSTORY	An underlying layer of low vegetation.
URBAN FRINGE	The boundary of an urban area where open space or undeveloped land predominates.
URBAN RUNOFF	All water which flows over hard surfaces such as roads and parking lots into municipal drainage systems. This water washes off many pollutants which accumulate between rains and carries them to the marine environment.

WASTEWATER	Spent or used water from every source; in this report it refers primarily to water that has been used in industrial processes or in the home and then discharged to a collection and treatment system.
WASTEWATER RECLAMATION	Processing of wastewater for reuse.
0/00	Parts per thousand; an indication of concentration.

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* Many of the above water-related definitions were taken directly from the *Central Coastal Water Quality Control Plan Report, Part II* (California State Water Resources Control Board, 1975).

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Cain, Robert. City of San Diego.

Cardwell, Frances. Resources Technician, Cleveland National Forest.

Cheshire, Jim. Chief, Environmental Branch, California Department of Transportation, San Diego.

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Munsel, Marion. Associate Planner, City of San Diego.

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O'Leary, Dennis. Vice President, Lowry and Associates.

Pena, Tony. Assistant Planner, City of Coronado.

Price, Tim. Associate Regional Planner, Comprehensive Planning Organization of the San Diego Region.

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Appendix A

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

ORDER NO. 77 - 18

NPDES NO. CA0107409

WASTE DISCHARGE REQUIREMENTS
FOR
THE CITY OF SAN DIEGO
POINT LOMA WASTEWATER TREATMENT PLANT
OCEAN OUTFALL

The California Regional Water Quality Control Board, San Diego Region (hereafter Regional Board), finds that:

1. On November 4, 1974, this Regional Board adopted Order No. 74-50, NPDES No. CA0107468, WASTE DISCHARGE REQUIREMENTS FOR THE CITY OF SAN DIEGO POINT LOMA WASTEWATER TREATMENT PLANT OCEAN OUTFALL.

2. On May 6, 1975, Mr. Leonard Burtman, Executive Officer for the Regional Board, issued Technical Change Order No. T-1 for Monitoring and Reporting Program No. 74-50. Technical Change Order Nos. T-2, T-3 and T-4 were issued by Mr. Burtman on November 28, 1975, October 19, 1976 and December 16, 1976, respectively. On June 14, 1976, this Regional Board adopted Addendum No. 1 to Order No. 74-50, AN ADDENDUM MODIFYING COMPLIANCE SCHEDULES OF ORDER NO. 74-50 FOR THE CITY OF SAN DIEGO POINT LOMA WASTEWATER TREATMENT PLANT OCEAN OUTFALL.

3. Order No. 74-50, Addendum No. 1, and Technical Change Orders No. 1, 2, 3 and 4 thereto, currently serves as a National Pollutant Discharge Elimination System (NPDES) Permit for City of San Diego ocean outfall's waste discharge. Order No. 74-50 contains an expiration date of June 1, 1977.

4. The City of San Diego submitted a Report of Waste Discharge dated March 22, 1977 in application for renewal of their National Pollutant Discharge Elimination System Permit for the existing discharge.

5. The City of San Diego presently discharges approximately 116 million gallons per day (MGD) of treated domestic and industrial sewage containing pollutants into the Pacific Ocean, a navigable water of the United States, from an ocean outfall located offshore of Point Loma.

6. The discharge consists of wastewater collected in the San Diego Metropolitan sewerage system and treated in the Point Loma wastewater treatment plant. The City of San Diego operates the Metropolitan sewerage system and the Point Loma wastewater treatment plant.

7. The San Diego Metropolitan sewerage system presently consists of 1,988 miles of sewer, two main pump stations, a 120-million-gallons-per-day capacity primary sewage treatment plant, and a 14,000 foot ocean outfall.

8. The Metropolitan sewerage system serves over 1.2 million people in 16 municipalities and districts: The City of San Diego, the City of Chula Vista, the City of Coronado, the City of Del Mar, the City of El Cajon, the City of Imperial Beach, the City of La Mesa, the City of National City, the Lemon Grove Sanitation District, the Montgomery Sanitation District, the Pomerado County Water District, the Rolando Sanitation District, the Spring Valley Sanitation District, the Alpine Sanitation District, the Lakeside Sanitation District, and the Padre Dam Water Resources Agency. The Metropolitan sewerage system also serves the City of Tijuana, Mexico, via a standby emergency connection.

9. Wastewater is pumped via a force main to the Point Loma wastewater treatment plant. The wastewater undergoes primary treatment in aerated grit tanks followed by sedimentation tanks. Sludge collected in the sedimentation tanks is pumped to anaerobic digestors. The digested sludge is disposed of in drying beds on Fiesta Island in Mission Bay.

10. The outfall structure has an elongated wye shape. The main portion of the structure terminates 11,400 feet offshore of the plant in 200 feet of water at a point 32°40'23" North Latitude and 117°17'0" West Longitude. Two diffuser sections, each 1,360 feet long, form the arms of the wye and terminate in 220 feet of water.

11. A significant portion of the flow to the Point Loma wastewater treatment plant is derived from industrial sources. As a consequence, the effluent contains concentrations of toxic elements which are in excess of limits of the State's Ocean Plan. Since conventional treatment processes do not normally remove these elements, it is expected the discharger will institute a comprehensive source control program. The City of San Diego has reviewed their present source control program according to the published guidelines and have concluded that the program complies with the requirements except for the self-monitoring provisions.

12. Partial results of analysis of samples of the Point Loma effluent, submitted by the City of San Diego, are as follows:

Constituent	Units	Eight Month Average Value
5-day 20°C Biochemical Oxygen Demand	mg/l	178
	lbs/day	170,720
Suspended Solids	mg/l	119
	lbs/day	114,130

Note: mg/l = milligrams per liter
lbs/day = pounds per day

13. The discharger reports that future plans are to upgrade their discharge to meet Environmental Protection Agency (EPA) requirements of an increased degree of treatment (secondary). The discharger has completed facility planning for the upgraded treatment and has applied for a design and construction grant from the State Water Resources Control Board (SWRCB). The City of San Diego's new facilities are expected to be completed by January 1, 1983. This date is contingent on several items including completion of an Environmental Impact Statement (EIS) by EPA and concept approval by the SWRCB and EPA.

14. The City of San Diego is currently investigating solutions to an approaching capacity problem at the Point Loma treatment plant. The City of San Diego plans on relieving the capacity problem by encouraging water conservation, thus reducing the sewage flows, reducing the flow of sewage into the system from the City of Tijuana, Mexico, and increasing the treatment capability of the Point Loma plant with the aid of chemicals.

15. The State Water Resources Control Board adopted the Water Quality Control Plan, Ocean Waters of California, on July 6, 1972. This plan contains water quality objectives for the following parameters in order to protect the beneficial uses of the Pacific Ocean:

    (a) Bacteria
    (b) Physical Characteristics
    (c) Chemical Characteristics
    (d) Biological Characteristics
    (e) Toxicity
    (f) Radioactivity

16. The Comprehensive Water Quality Control Plan Report San Diego Basin (9), adopted by this Regional Board on March 17, 1975 and approved by the State Water Resources Control Board on March 20, 1975, established water quality objectives for the Pacific Ocean.

17. The beneficial uses of the Pacific Ocean include industrial service supply, navigation, water contact and non-contact water recreation, ocean commercial and sport fishing, preservation of areas of special biological significance, preservation of rare and endangered species, marine habitat, fish migration, and shellfish harvesting.

18. Effluent limitation, national standards of performance, toxic and pretreatment effluent standards, and ocean discharge criteria established pursuant to Sections 208(b), 301, 302, 303(d), 304, 306, 307 and 403 of the Federal Water Pollution Control Act, and amendments thereto are applicable to the discharge.

19. The Regional Board has notified the discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for the proposed discharge and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.

20. THE REGIONAL BOARD IN A PUBLIC MEETING HEARD AND CONSIDERED ALL COMMENTS PERTAINING TO THE DISCHARGE.

21. THIS ORDER SHALL SERVE AS A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT PURSUANT TO SECTION 402 OF THE FEDERAL WATER POLLUTION CONTROL ACT, OR AMENDMENTS THERETO.

IT IS HEREBY ORDERED, THE CITY OF SAN DIEGO, IN ORDER TO MEET THE PROVISIONS CONTAINED IN DIVISION 7 OF THE CALIFORNIA WATER CODE AND REGULATIONS ADOPTED THEREUNDER AND THE PROVISIONS OF THE FEDERAL WATER POLLUTION CONTROL ACT, AND REGULATIONS AND GUIDELINES ADOPTED THEREUNDER, SHALL COMPLY WITH THE FOLLOWING:

A. EFFLUENT LIMITATIONS

1. UNTIL JULY 1, 1977, THE DISCHARGE OF EFFLUENT CONTAINING POLLUTANTS IN EXCESS OF THE FOLLOWING LIMITS IS PROHIBITED:

CONSTITUENTS	UNITS	MONTHLY[1] AVERAGE	DAILY[2] MAXIMUM
GREASE AND OIL	MG/L	60	75
	LBS/DAY[3]	60,048	75,060
SUSPENDED SOLIDS	MG/L	150	200
	LBS/DAY	150,120	200,160
TOTAL HEAVY METALS	MG/L	2	5
	LBS/DAY	2,001	5,004

2. UNTIL JULY 1, 1977, THE TOXICITY OF THE SEWAGE EFFLUENT TO MARINE ANIMALS AND PLANTS SHALL NOT EXCEED THE FOLLOWING LIMIT: THE CONCENTRATION OF SEWAGE IN SEA WATER CAUSING (A) A 50 PERCENT MORTALITY AFTER 48 HOURS IN SUITABLE MARINE ANIMAL TEST ORGANISMS, OR (B) A 50 PERCENT CHANGE IN PHOTOSYNTHETIC ACTIVITY AFTER 48 HOURS IN SUITABLE MARINE PLANTS, RESPECTIVELY, SHALL BE GREATER THAN 10 PERCENT.

3. AFTER JULY 1, 1977, THE DISCHARGE OF AN EFFLUENT CONTAINING POLLUTANTS IN EXCESS OF THE FOLLOWING LIMITS IS PROHIBITED:

(A) CONSTITUENTS	UNITS	MONTHLY[1] AVERAGE	WEEKLY[4] AVERAGE	DAILY[2] MAXIMUM
5-DAY 20°C BOD[7]	MG/L	30	45	50
	LBS/DAY[3]	30,024	45,036	50,040
SUSPENDED SOLIDS[7]	MG/L	30	45	50
	LBS/DAY	30,024	45,036	50,040

A LIST OF ALL FOOTNOTES REFERENCED WILL BE FOUND FOLLOWING THE LAST PAGE OF THE WASTE DISCHARGE REQUIREMENTS SECTION.

(B)

CONSTITUENTS	UNITS	CONCENTRATION NOT TO BE EXCEEDED MORE THAN 50% OF THE TIME	CONCENTRATION NOT TO BE EXCEEDED MORE THAN 10% OF THE TIME
GREASE AND OIL	MG/L	10	15
	LBS/DAY	10,008	15,012
FLOATING PARTICULATES	MG/L	1.0	2.0
	LBS/DAY	1,000	2,001
SETTLEABLE SOLIDS	ML/L	0.1	0.2
TURBIDITY	JTU	50	75
PH	UNITS	(WITHIN RANGE 6-9)	

(C) THE ANNUAL ARITHMETIC MEAN OF THE SUM OF THE CONCENTRATIONS OF THE FOLLOWING METALS IN THE DISCHARGE SHALL NOT EXCEED 2.0 MG/L AND THE SUM OF THE CONCENTRATIONS SHALL NOT EXCEED 5.0 MG/L AT ANY TIME: CADMIUM, HEXAVALENT CHROMIUM, COPPER, LEAD, MERCURY, NICKEL, SILVER AND ZINC.

4. AFTER JULY 1, 1978, THE DISCHARGE SHALL CONFORM WITH ALL PROVISIONS OF TABLE B OF THE STATE WATER RESOURCES CONTROL BOARD'S WATER QUALITY CONTROL PLAN, OCEAN WATERS OF CALIFORNIA IN THEIR PRESENT FORM OR AS THEY MAY BE AMENDED. THE PRESENT REQUIREMENTS OF TABLE B ARE AS FOLLOWS:

CONSTITUENTS	UNITS	CONCENTRATION NOT TO BE EXCEEDED MORE THAN 50% OF THE TIME	CONCENTRATION NOT TO BE EXCEEDED MORE THAN 10% OF THE TIME
ARSENIC	MG/L	0.01	0.02
	LBS/DAY	10	20
CADMIUM	MG/L	0.02	0.03
	LBS/DAY	20	30
TOTAL CHROMIUM	MG/L	0.005	0.01
	LBS/DAY	5	10
COPPER	MG/L	0.2	0.3
	LBS/DAY	200	300
LEAD	MG/L	0.1	0.2
	LBS/DAY	100	200
MERCURY	MG/L	0.001	0.002
	LBS/DAY	1	2
NICKEL	MG/L	0.1	0.2
	LBS/DAY	100	200

NOTE: ML/L = MILLILITERS PER LITER
JTU = JACKSON TURBIDITY UNITS

CONSTITUENTS	UNITS	CONCENTRATION NOT TO BE EXCEEDED MORE THAN	
		50% OF THE TIME	10% OF THE TIME
SILVER	MG/L	0.02	0.04
	LBS/DAY	20	40
ZINC	MG/L	0.3	0.5
	LBS/DAY	300	500
PHENOLIC COMPOUNDS	MG/L	0.5	1.0
	LBS/DAY	500	1,000
CYANIDE	MG/L	0.1	0.2
	LBS/DAY	100	200
TOTAL CHLORINE RESIDUAL	MG/L	1.0	2.0
	LBS/DAY	1,000	2,000
AMMONIA (EXPRESSED AS NITROGEN)	MG/L	40.0	60.0
	LBS/DAY	40,000	60,000
TOTAL IDENTIFIABLE CHLORINATED HYDROCARBONS	MG/L	0.002	0.004
	LBS/DAY	2	4
TOXICITY CONCENTRATION	TU	1.5	2.0
RADIOACTIVITY	PCI/L	NOT TO EXCEED THE LIMITS SPECIFIED IN TITLE 17, CHAPTER 5, SUBCHAPTER 4, GROUP 3, ARTICLE 5, SECTION 30285 AND 30287 OF THE CALIFORNIA ADMINISTRATIVE CODE.	

B. RECEIVING WATER LIMITATIONS

1. THE DISCHARGE SHALL NOT CAUSE THE FOLLOWING LIMITS TO BE EXCEEDED OUTSIDE OF THE INITIAL DILUTION ZONE:[5]

CONSTITUENTS	UNITS	CONCENTRATION NOT TO BE EXCEEDED MORE THAN	
		50% OF THE TIME	10% OF THE TIME
GREASE AND OIL	MG/M^2	10.0	20.0
FLOATING PARTICULATES	MG DRY WT/M^2	1.0	1.5
TOXICITY	TOXICITY UNITS	--	0.05
RADIOACTIVITY	PCI/L	NOT TO EXCEED THE LIMITS SPECIFIED IN TITLE 17, CHAPTER 5, SUBCHAPTER 4, GROUP 3, ARTICLE 5, SECTION 30285 AND 30287 OF THE CALIFORNIA ADMINISTRATIVE CODE.	

NOTE: TU = TOXICITY UNITS
PCI/L = PICOCURIES PER LITER
MG/M^2 = MILLIGRAMS PER SQUARE METER
MG DRY WT/M^2 = MILLIGRAMS DRY WEIGHT PER SQUARE METER

2. The discharge shall not cause concentrations of coliform organisms within a zone bounded by the shoreline and a distance of 1,000 feet from the shoreline or the 30-foot depth contour, whichever is further from the shoreline, and in areas outside of this zone used for body-contact sports, to exceed the following:

   A Most Probable Number of 1,000 per 100 ml (10 per ml) in more than 20 percent of the samples at any sampling station in any 30 day period, or a Most Probable Number of 10,000 per 100 ml (100 per ml) in any single sample when verified by a repeat sample taken within 48 hours.

3. The discharge shall not cause the concentration of total coliform organisms in any areas where shellfish may be harvested for human consumption to exceed the following:

   A median Most Probable Number of 70 per 100 ml with not more than 10 percent of the samples exceeding a Most Probable Number of 230 per 100 ml.

4. The discharge shall not cause:

   (a) Floating particulates or grease and oil to be visible at any location;

   (b) Aesthetically undesirable discoloration on the ocean surface at any location;

   (c) The transmittance of natural light outside of the initial dilution zone[5] to be reduced by more than one standard deviation from the mean determined for unaffected waters during the same period;

   (d) The dissolved oxygen concentrations of waters outside of the initial dilution zone[5] to be depressed more than 10 percent from concentrations which occur naturally;

   (e) The pH outside of the initial dilution zone[5] to be changed more than 0.2 units from the pH which occurs naturally;

   (f) The rate of deposition of inert solids and the characteristics of inert solids in ocean sediments to be changed such that benthic communities are degraded;[6]

   (g) The dissolved sulfide concentration of waters in and near sediments to be increased by more than one standard deviation from the mean determined under natural conditions;

   (h) The concentrations of heavy metals, cyanide, phenolic compounds, total identifiable chlorinated hydrocarbons and radioactivity in sediments to be increased by more than one standard deviation from the mean determined under natural conditions;

   (i) The concentrations of organic materials in marine sediments to be increased above those which would degrade[6] marine life;

(j) Nutrient materials in concentrations that would cause objectionable aquatic growths or degrade[6] indigenous biota;

(k) Marine communities including vertebrate, invertebrate, and plant species to be degraded[6]; or

(l) Alteration of natural taste, odor, and color fish, shellfish or other marine resources used for human consumption.

C. PROVISIONS

1. This Order is established only for a waste disposal operation as hereinbefore described and a waste discharge volume not in excess of 120 MGD.
2. Neither the treatment nor the discharge of pollutants shall create a pollution, contamination or nuisance as defined by the California Water Code.
3. Bypassing or direct discharge of treated or untreated liquid or solid wastes to any navigable waters is prohibited.
4. Odors, vectors and other nuisances of sewage or sewage sludge origin beyond the limits of the treatment plant site are prohibited.
5. All waste treatment and disposal facilities shall be protected against a 100-year-frequency flood as defined by the San Diego County flood control agency.
6. This Order includes Items 1, 2, 4 and 5 of the attached "Reporting Requirements."
7. This Order includes Items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11 of the attached "Standard Provisions."
8. This Order includes the attached "General Monitoring and Reporting Provisions."
9. The discharger shall comply with the Monitoring and Reporting Program of Order No. 74-50 as modified until October 1, 1977. After October 1, 1977, the discharger shall comply with the Monitoring and Reporting Program contained in this Order, or as modified by the Executive Officer.
10. This Order becomes effective on the expiration date of Order No. 74-50 - June 1, 1977.
11. This Order expires September 1, 1981, and the discharger must file a Report of Waste Discharge in accordance with Title 23, California Administrative Code, not later than 180 days in advance of such date, as application for issuance of new waste discharge requirements.
12. In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the discharger, the discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be forwarded to this Board.

13. THIS ORDER DOES NOT RELIEVE THE DISCHARGER OF THE RESPONSIBILITY TO OBTAIN OTHER NECESSARY LOCAL, STATE, AND FEDERAL PERMITS TO CONSTRUCT FACILITIES NECESSARY FOR COMPLIANCE WITH THIS ORDER; NOR DOES THIS ORDER PREVENT IMPOSITION OF ADDITIONAL STANDARDS, REQUIREMENTS, OR CONDITIONS BY ANY OTHER REGULATORY AGENCY.

I, LEONARD BURTMAN, EXECUTIVE OFFICER, DO HEREBY CERTIFY THE FOREGOING IS A FULL, TRUE, AND CORRECT COPY OF AN ORDER ADOPTED BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO REGION, ON MAY 23, 1977.

Leonard Burtman

LEONARD BURTMAN
EXECUTIVE OFFICER

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

FOOTNOTE REFERENCES FOR WASTE DISCHARGE REQUIREMENTS OF ORDER NO. 77-18 (NPDES PERMIT NO. CA0107409) - CITY OF SAN DIEGO POINT LOMA WASTEWATER TREATMENT PLANT OCEAN OUTFALL

1. THE MONTHLY AVERAGE SHALL BE THE ARITHMETIC MEAN, USING THE RESULTS OF ANALYSES OF ALL SAMPLES COLLECTED DURING ANY 30 CONSECUTIVE CALENDAR DAY PERIOD.

2. THE DAILY MAXIMUM SHALL BE DETERMINED FROM THE RESULTS OF A SINGLE GRAB SAMPLE OR FROM THE RESULT OF A SINGLE COMPOSITE SAMPLE COLLECTED OVER A PERIOD OF 24 HOURS.

3. THE DISCHARGE RATE IN POUNDS PER DAY IS OBTAINED FROM THE FOLLOWING CALCULATION FOR ANY CALENDAR DAY:

$$\text{DISCHARGE RATE (LBS/DAY)} = \frac{8.34}{N} \sum_{1}^{N} Q_i\, C_i$$

IN WHICH N IS THE NUMBER OF SAMPLES ANALYZED IN ANY CALENDAR DAY. Q_i AND C_i ARE THE FLOW RATE (MGD) AND THE CONSTITUENT CONCENTRATION (MG/L)' RESPECTIVELY, WHICH ARE ASSOCIATED WITH EACH OF THE N GRAB SAMPLES WHICH MAY BE TAKEN IN ANY CALENDAR DAY. IF A COMPOSITE SAMPLE IS TAKEN, C_i IS THE CONCENTRATION MEASURED IN THE COMPOSITE SAMPLE, AND Q_i IS THE AVERAGE FLOW RATE OCCURRING DURING THE PERIOD OVER WHICH SAMPLES ARE COMPOSITED.

4. THE WEEKLY AVERAGE SHALL BE THE ARITHMETIC MEAN, USING THE RESULTS OF ANALYSES OF ALL SAMPLES COLLECTED WITHIN ANY SEVEN CONSECUTIVE CALENDAR DAY PERIOD.

5. THE INITIAL DILUTION ZONE SHALL BE AS DEFINED IN THE WATER QUALITY CONTROL PLAN, OCEAN WATERS OF CALIFORNIA, ADOPTED BY THE STATE WATER RESOURCES CONTROL BOARD ON JULY 6, 1972.

6. DEGRADATION SHALL BE DETERMINED BY ANALYSIS OF THE EFFECTS OF WASTE DISCHARGE ON SPECIES DIVERSITY, POPULATION DENSITY, GROWTH ANOMALIES, DEBILITY, OR SUPPLANTING OF NORMAL SPECIES BY UNDESIRABLE PLANT AND ANIMAL SPECIES.

7. THE ARITHMETIC MEAN OF BOD AND SUSPENDED SOLIDS VALUES, BY WEIGHT, FOR EFFLUENT SAMPLES COLLECTED IN A PERIOD OF 30 CONSECUTIVE CALENDAR DAYS SHALL NOT EXCEED 15 PERCENT OF THE ARITHMETIC MEAN OF VALUES, BY WEIGHT, FOR INFLUENT SAMPLES COLLECTED AT APPROXIMATELY THE SAME TIMES DURING THE SAME PERIOD.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

MONITORING AND REPORTING PROGRAM NO. 77 - 18

FOR
THE CITY OF SAN DIEGO
POINT LOMA WASTEWATER TREATMENT PLANT
OCEAN OUTFALL

EFFLUENT MONITORING

A sampling station shall be established downstream from the last connection through which wastes can be admitted to the outfall and shall be located where representative samples of the discharge can be obtained.

The following shall constitute the effluent monitoring program:

Determination	Units	Type of Sample	Minimum Frequency of Analysis
Flow	MGD	Measurement	Continuous
pH	Units	Grab[2]	Daily[1]
Biochemical Oxygen Demand	mg/L	24-hr. composite	"
Chlorine Residual	"	Grab[2]	"
Suspended Solids - Total	"	24-hr. composite	"
Suspended Solids - Volatile	"	"	"
Settleable Solids	mL/L	Grab[2]	"
Turbidity	JTU	24-hr. composite	"
Floating Particulates	mg/L (dry)	"	"
Grease and Oil	mg/L	Grab[2]	"
Toxicity Concentration	TU	24-hr. composite	Monthly*
Ammonia[3] (as N)	mg/L	"	Weekly
Cyanide	"	"	"
Metals			
Arsenic	"	"	Monthly
Cadmium	"	"	"
Chromium, total	"	"	"
Copper	"	"	"
Lead	"	"	"
Mercury[4]	"	"	"
Nickel	"	"	"
Silver	"	"	"
Zinc	"	"	"
Chromium, Hexavalent	"	"	"
Chlorinated Hydrocarbons[5]	"	"	Weekly
Phenolic Compounds	"	"	Monthly
Radioactivity	pCi/L	"	"

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* The frequency shall be increased to weekly if at any time the concentration exceeds 1.5 TU.

Note: MGD = million gallons per day
mg/L = milligrams per liter
mL/L = milliliters per liter
JTU = Jackson Turbidity Units
pCi/L = Picocuries per liter

A list of all footnotes referenced will be found following the last page of the Monitoring and Reporting Program.

INFLUENT MONITORING

INFLUENT MONITORING SHALL BE CONDUCTED AS SHOWN BELOW, BEGINNING WITH THE EFFECTIVE DATE OF THIS ORDER:

CONSTITUENT	UNITS	TYPE OF SAMPLE	MINIMUM FREQUENCY OF ANALYSIS
5-DAY 20°C BIOCHEMICAL OXYGEN DEMAND	MG/L	24-HR. COMPOSITE	MONTHLY
SUSPENDED SOLIDS - TOTAL	"	"	"
SUSPENDED SOLIDS - VOLATILE	"	"	"

THE DISCHARGER SHALL SUBMIT A MONTHLY REPORT CONTAINING THE FOLLOWING INFORMATION:

1. THE NUMBER OF EQUIVALENT UNIT CONNECTIONS TO THE SEWERAGE SYSTEM AT THE BEGINNING OF THE MONTH.
2. THE NUMBER OF NEW EQUIVALENT UNIT CONNECTIONS ADDED TO THE SEWERAGE SYSTEM DURING THE MONTH.
3. THE NUMBER OF EQUIVALENT UNIT CONNECTIONS WHICH HAVE BEEN AUTHORIZED BUT NOT YET CONNECTED.
4. THE ANTICIPATED INCREASE IN INFLUENT FLOW VOLUME RESULTING FROM CONNECTING THE UNITS DESCRIBED IN ITEM 3.

RECEIVING WATER AND SEDIMENT MONITORING

RECEIVING WATER AND SEDIMENT MONITORING SHALL BE CONDUCTED AS SPECIFIED BELOW. STATION LOCATION, SAMPLING, SAMPLE PRESERVATION AND ANALYSES, WHEN NOT SPECIFIED, SHALL BE BY METHODS APPROVED BY THE EXECUTIVE OFFICER. THE MONITORING PROGRAM MAY BE MODIFIED BY THE EXECUTIVE OFFICER AT ANY TIME.

DISPERSION AREA STATIONS

DISPERSION AREA STATIONS SHALL BE LOCATED WITHIN A SQUARE, TWO NAUTICAL MILES ON A SIDE, WITH ITS CENTER LOCATED OVER THE WYE JUNCTION OF THE DIFFUSER AND WITH ITS SIDES PARALLEL OR NORMAL TO THE PRINCIPAL AXIS OF THE OUTFALL. STATIONS SHALL BE LOCATED AND NUMBERED AS FOLLOWS:

STATION	DESCRIPTION
A-1	AT THE SOUTHEAST CORNER OF THE SQUARE
A-2	MIDWAY BETWEEN THE SOUTHEAST AND SOUTHWEST CORNER
A-3	AT THE SOUTHWEST CORNER
A-4	AT THE NORTHWEST CORNER
A-5	MIDWAY BETWEEN THE NORTHWEST AND NORTHEAST CORNER

Station	Description
A-6	At the northeast corner
A-7	Midway between the northeast and southeast corner
A-8	Midway between wye and Station A-2
A-9	Midway between wye and Station A-5
A-10	Midway between Stations A-1 and A-2
A-11	Midway between Stations A-2 and A-7
A-12	Midway between wye and Station A-7
A-13	Midway between Stations A-5 and A-7
A-14	Midway between Stations A-5 and A-6
A-15	Midway between wye and Station A-8
A-16	Midway between wye and Station A-9

Reference Area Stations

Reference area stations shall be located and numbered as follows:

Station	Description
B-1	The intersection of a line running due west from the foot of Palm Avenue in Imperial Beach and the 35 fathom contour
B-2) B-3) B-4)	The intersections of a line parallel to the outfall beginning at San Fernando Place in Mission Beach and the respective contours passing through Stations A-4, A-5 and A-6

Nearshore Stations

Nearshore stations shall be located at the offshore edge of the water contact sports area north of Point Loma. These stations shall be located and numbered as follows:

Station	Description
C-4	2500 ft. seaward of Station D-4
C-5	2500 ft. seaward of Station D-5
C-6	2500 ft. seaward of Station D-6
C-7	5000 ft. seaward of Station D-7
C-8	5000 ft. seaward of Station D-8

MONITORING AND REPORTING PROGRAM NO. 77-18

SHORE STATIONS

SHORE STATIONS SHALL BE LOCATED AND NUMBERED AS FOLLOWS:

STATION	DESCRIPTION
D-1	FOOT OF PALM AVENUE, IMPERIAL BEACH
D-2	NORTHERLY PROPERTY LINE, SILVER STRAND BEACH STATE PARK
D-3	SOUTH SIDE OF HOTEL DEL CORONADO BREAKWATER
D-4	100 FT. NORTH OF POINT LOMA COAST GUARD STATION
D-5	BASE OF OUTFALL
D-6	FOOT OF WOODWARD STREET PROLONGED
D-7	COVE BELOW CALIFORNIA WESTERN UNIVERSITY DORMITORIES
D-8	FOOT OF OSPREY STREET
D-9	FOOT OF NARRAGANSETT STREET

RECEIVING WATER MONITORING SHALL BE CONDUCTED AS FOLLOWS:

DETERMINATION	UNITS	STATION	TYPE OF SAMPLE	MINIMUM FREQUENCY OF ANALYSIS
VISUAL OBSERVATIONS	--	A-1, A-2, A-5, A-6, A-7	--	MONTHLY
		B-1 AND B-3	--	"
		C-4 THROUGH C-8	--	"
		D-1 THROUGH D-9	--	*
TOTAL COLIFORMS	MPN/100 ML	A-1, A-2, A-5, A-6, A-7 6/	GRAB	MONTHLY
		B-1 AND B-3 6/	"	"
		C-4 THROUGH C-8 7/	"	"
		D-1 THROUGH D-9	"	*
TEMPERATURE	°F	A-1, A-2, A-5, A-6, A-7 6/	GRAB	MONTHLY
		B-1 AND B-3 6/	"	"
CHLORIDE	MG/L	A-1, A-2, A-5, A-6, A-7 6/	GRAB	MONTHLY
		B-1 AND B-3 6/	"	"
DISSOLVED OXYGEN	MG/L	A-1, A-2, A-5, A-6, A-7 6/	GRAB	MONTHLY
		B-1 AND B-3 6/	"	"
FLOATING PARTICULATES	MG/M^2	A-1, A-2, A-5, A-6, A-7 6/	GRAB	MONTHLY
		B-1 AND B-3 6/	"	"

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* WEEKLY MAY 1 THROUGH OCTOBER 31; BI-WEEKLY NOVEMBER 1 THROUGH APRIL 30

NOTE: MPN/100 ML = MOST PROBABLE NUMBER PER 100 MILLILITERS
°F = DEGREE FAHRENHEIT
MG/M^2 = MILLIGRAMS PER SQUARE METER

DETERMINATION	UNITS	STATION	TYPE OF SAMPLE	MINIMUM FREQUENCY OF ANALYSIS
GREASE AND OIL	MG/M^2	A-1, A-2, A-5, A-6, A-7 [6]	GRAB	MONTHLY
		B-1 AND B-3 [6]	"	"
LIGHT TRANSMITTANCE	%/M	A-1, A-2, A-5, A-6, A-7 [8]	"	"
		B-1 AND B-3 [8]	"	"
KELP	--	**	"	ANNUALLY

ANALYSES OF SEDIMENT SAMPLES SHALL BE CONDUCTED AS FOLLOWS:

DETERMINATION	UNITS	STATION	TYPE OF SAMPLE	MINIMUM FREQUENCY OF ANALYSIS
BENTHIC BIOTA	IDENTIFICATION AND ENUMERATION [9]	A-2, A-5, A-8 THROUGH A-16	4 GRABS	QUARTERLY
		B-1 THROUGH B-4	"	"
SULFIDES	MG/KG	A-2, A-5, A-8 THROUGH A-16	CORE [10]	QUARTERLY
		B-1 THROUGH B-4	"	"
TOTAL CHLORINATED HYDROCARBONS	MG/KG	A-2, A-5, A-8 THROUGH A-16	CORE [10]	QUARTERLY
		B-1 THROUGH B-4	"	"
BIOCHEMICAL OXYGEN DEMAND	MG/KG	A-2, A-5, A-8 THROUGH A-16	CORE [10]	QUARTERLY
		B-1 THROUGH B-4	"	"
CHEMICAL OXYGEN DEMAND	MG/KG	A-2, A-5, A-8 THROUGH A-16	CORE [10]	QUARTERLY
		B-1 THROUGH B-4	"	"
PARTICLE SIZE DISTRIBUTION	--	A-2, A-5, A-8 THROUGH A-16	CORE [10]	QUARTERLY
		B-1 THROUGH B-4	"	"
TEMPERATURE	°F	A-2, A-5, A-8 THROUGH A-16	CORE [10]	QUARTERLY
		B-1 THROUGH B-4	"	"

** THE AREAL EXTENT OF ALL KELP BEDS WITHIN A TWO MILE RADIUS OF THE CENTER OF THE OUTFALL DIFFUSER SECTION SHALL BE DETERMINED BY AERIAL PHOTOGRAPHY.

NOTE: %/M = PERCENT PER METER
MG/KG = MILLIGRAMS PER KILOGRAM

Monitoring and Reporting Program No. 77-18

Determination	Units	Station	Type of Sample	Minimum Frequency of Analysis
Metals***				
Arsenic	mg/kg	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4	"	"
Cadmium	mg/kg	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4	"	"
Total Chromium	mg/kg	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4	"	"
Copper	mg/kg	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4	"	"
Lead	mg/kg	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4	"	"
Mercury	mg/kg	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4		
Nickel	mg/kg	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4	"	"
Silver	mg/kg	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4	"	"
Zinc	mg/kg	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4	"	"
Cyanide	mg/kg	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4	"	"
Phenolic Compounds	mg/kg	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4	"	"
Radioactivity	pCi/ml	A-2, A-5, A-8 through A-16	2 Cores[10]	Twice a year
		B-1 through B-4		

*** Separate analysis on animals caught on a one millimeter screen and on a sample of the sediment collected with a core sampler.

MONITORING AND REPORTING PROGRAM No. 77-18

MONITORING REPORTS SHALL BE SUBMITTED TO THE BOARD ACCORDING TO THE DATES IN THE FOLLOWING SCHEDULE:

MONITORING FREQUENCY	REPORT DUE
CONTINUOUS, DAILY, WEEKLY, MONTHLY, OR ONCE EVERY TWO MONTHS	BY THE 30TH DAY OF THE FOLLOWING MONTH
QUARTERLY	MARCH 30, JUNE 30, SEPTEMBER 30, DECEMBER 30
TWICE A YEAR	JANUARY 30, JULY 30

ORDERED BY Leonard Burtman

LEONARD BURTMAN
EXECUTIVE OFFICER
MAY 23, 1977

RDR:LS

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

Footnote references for Monitoring and Reporting Program No. 77-18 (NPDES Permit No. CA0107409) - THE CITY OF SAN DIEGO POINT LOMA WASTEWATER TREATMENT PLANT, OCEAN OUTFALL

1. Seven days per week

2. Samples shall be collected at times when wastewater flows and characteristics are most demanding on treatment and disinfection procedures.

3. Analysis to be performed according to method contained in Methods for Chemical Analysis of Water and Wastes, 1971, Environmental Protection Agency, Analytical Quality Control Laboratory, Cincinnati, Ohio, page 134. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

4. Analysis to be performed according to American Society for Testing Material Method D, 3223-73, Journal of the American Water Works Association, Vol. 64, No. 1, pp. 20-25 (January 1972).

5. Analysis to be performed according to interim procedures for algicides, chlorinated organic compounds and pesticides which can be obtained from the Methods Development and Quality Assurance Research Laboratory, National Environmental Research Center, U. S. EPA, Cincinnati, Ohio 45268.

6. Surface and 50-60 feet beneath the surface

7. Surface

8. 5, 10, 20, 40 and 60 feet beneath the surface

9. Samples are to be collected with a Peterson, Smith-McIntyre, or orange-peel-type dredge having an open sampling area of not less than 125 square inches and a sediment capacity of not less than 210 cubic inches. The sediment shall be sifted through a one millimeter mesh screen and all organisms shall be identified to as low a taxon as possible.

10. Analysis to be performed on the upper two inches of core.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

REPORTING REQUIREMENTS

1. The discharger shall file with the Board and the Regional Administrator of the Environmental Protection Agency technical reports on self-monitoring work performed according to the detailed specifications contained in any Monitoring and Reporting Program as directed by the Executive Officer.

*2. The discharger shall file a written report with the Board within 90 days after the average dry-weather waste flow for any month equals or exceeds 75 percent of the design capacity of his waste treatment and/or disposal facilities. The discharger's senior administrative officer shall sign a letter which transmits that report and certifies that the policymaking body is adequately informed about it. The report shall include:

    Average daily flow for the month, the date on which the instantaneous peak flow occurred, the rate of that peak flow, and the total flow for that day.

    The discharger's best estimate of when the average daily dry-weather flow rate will equal or exceed the design capacity of his facilities.

    The discharger's intended schedule for studies, design, and other steps needed to provide additional capacity for his waste treatment and/or disposal facilities before the waste flow rate equals the capacity of present units. (Reference: Sections 13260, 13267(b), and 13268, California Water Code.)

**3. The discharger shall notify the Board not later than 180 days in advance of implementation of any plans to alter production capacity of the product line of the manufacturing, producing or processing facility by more than ten percent. Such notification shall include estimates of proposed production rate, the type of process, and projected effects on effluent quality. Notification shall include submittal of a new Report of Waste Discharge and appropriate filing fee.

*4. The discharger shall notify the Board of (a) new introduction into such works of pollutants from a source which would be a new source as defined in Section 306 of the Federal Water Pollution Control Act, or amendments thereto, if such source were discharging pollutants to the waters of the United States, (b) new introductions of pollutants into such works from a source which would be subject to Section 301 of the Federal Water

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* Publicly owned facilities only

** For nonpublic facilities only

POLLUTION CONTROL ACT, OR AMENDMENTS THERETO, IF IT WERE DISCHARGING SUCH POLLUTANTS TO THE WATERS OF THE UNITED STATES, (c) A SUBSTANTIAL CHANGE IN THE VOLUME OR CHARACTER OF POLLUTANTS BEING INTRODUCED INTO SUCH WORKS BY A SOURCE INTRODUCING POLLUTANTS INTO SUCH WORKS AT THE TIME THE WASTE DISCHARGE REQUIREMENTS WERE ADOPTED. NOTICE SHALL INCLUDE A DESCRIPTION OF THE QUANTITY AND QUALITY OF POLLUTANTS AND THE IMPACT OF SUCH CHANGE ON THE QUANTITY AND QUALITY OF EFFLUENT FROM SUCH PUBLICLY OWNED TREATMENT WORKS. A SUBSTANTIAL CHANGE IN VOLUME IS CONSIDERED AN INCREASE OF TEN PERCENT IN THE MEAN DRY-WEATHER FLOW RATE. THE DISCHARGER SHALL FORWARD A COPY OF SUCH NOTICE DIRECTLY TO THE REGIONAL ADMINISTRATOR.

5. THE DISCHARGER SHALL FILE WITH THE BOARD A REPORT OF WASTE DISCHARGE AT LEAST 120 DAYS BEFORE MAKING ANY MATERIAL CHANGE OR PROPOSED CHANGE IN THE CHARACTER, LOCATION OR VOLUME OF DISCHARGE.

**6. THIS BOARD REQUIRES THE DISCHARGER TO FILE WITH THE BOARD, WITHIN 90 DAYS AFTER THE EFFECTIVE DATE OF THIS ORDER, A TECHNICAL REPORT ON HIS PREVENTIVE (FAIL-SAFE) AND CONTINGENCY (CLEANUP) PLANS FOR CONTROLLING ACCIDENTAL DISCHARGES, AND FOR MINIMIZING THE EFFECT OF SUCH EVENTS. THE TECHNICAL REPORT SHOULD:

> IDENTIFY THE POSSIBLE SOURCES OF ACCIDENTAL LOSS, UNTREATED WASTE BYPASS, AND CONTAMINATED DRAINAGE. LOADING AND STORAGE AREAS, POWER OUTAGE, WASTE TREATMENT UNIT OUTAGE, AND FAILURE OF PROCESS EQUIPMENT, TANKS AND PIPES SHOULD BE CONSIDERED.
>
> EVALUATE THE EFFECTIVENESS OF PRESENT FACILITIES AND PROCEDURES AND STATE WHEN THEY BECAME OPERATIONAL.
>
> DESCRIBE FACILITIES AND PROCEDURES NEEDED FOR EFFECTIVE PREVENTIVE AND CONTINGENCY PLANS.
>
> PREDICT THE EFFECTIVENESS OF THE PROPOSED FACILITIES AND PROCEDURES AND PROVIDE AN IMPLEMENTATION SCHEDULE CONTAINING INTERIM AND FINAL DATES WHEN THEY WILL BE CONSTRUCTED, IMPLEMENTED, OR OPERATIONAL. (REFERENCE: SECTIONS 13267(B) AND 13268, CALIFORNIA WATER CODE.)

THIS BOARD, AFTER REVIEW OF THE TECHNICAL REPORT, MAY ESTABLISH CONDITIONS WHICH IT DEEMS NECESSARY TO CONTROL ACCIDENTAL DISCHARGES AND TO MINIMIZE THE EFFECTS OF SUCH EVENTS. SUCH CONDITIONS MAY BE INCORPORATED AS PART OF THIS ORDER, UPON NOTICE TO THE DISCHARGER.

**7. THE DISCHARGER SHALL SUBMIT TO THE BOARD, BY JANUARY 30 OF EACH YEAR, AN ANNUAL SUMMARY OF THE QUANTITIES OF ALL CHEMICALS LISTED BY BOTH TRADE AND CHEMICAL NAMES, WHICH ARE USED FOR COOLING AND/OR BOILING WATER TREATMENT AND WHICH ARE DISCHARGED.

** FOR NONPUBLIC FACILITIES ONLY

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

STANDARD PROVISIONS

1. The requirements prescribed herein do not authorize the commission of any act causing injury to the property of another, nor protect the discharger from his liabilities under Federal, State, or local laws, nor guarantee the discharger a capacity right in the receiving waters.

2. The discharge of any radiological, chemical, or biological warfare agent or high level radiological waste is prohibited.

*3. The discharger shall require any industrial user of the treatment works to comply with applicable service charges and toxic and pretreatment standards promulgated in accordance with Sections 204(b), 307, and 308 of the Federal Water Pollution Control Act or amendments thereto. The discharger shall require each individual user to submit periodic notice (over intervals not to exceed nine months) of progress toward compliance with applicable toxic and pretreatment standards developed pursuant to the Federal Water Pollution Control Act or amendments thereto. The discharger shall forward a copy of such notice to the Board and the Regional Administrator of the Environmental Protection Agency.

4. The discharger shall permit the Regional Board:

   (a) Entry upon premises in which an effluent source is located or in which any required records are kept;

   (b) Access to copy any records required to be kept under terms and conditions of this Order;

   (c) Inspection of monitoring equipment or records, and

   (d) Sampling of any discharge.

5. All discharges authorized by this Order shall be consistent with the terms and conditions of this Order. The discharge of any pollutant more frequently than or at a level in excess of that identified and authorized by this Order shall constitute a violation of the terms and conditions of this Order.

6. The discharger shall maintain in good working order and operate as efficiently as possible any facility or control system installed by the discharger to achieve compliance with the waste discharge requirements.

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* Publicly owned facilities only

CRWQCB, San Diego Region
11/73

7. COLLECTED SCREENINGS, SLUDGES, AND OTHER SOLIDS REMOVED FROM LIQUID WASTES SHALL BE DISPOSED OF AT A LEGAL POINT OF DISPOSAL, AND IN ACCORDANCE WITH THE PROVISIONS OF DIVISION 7.5 OF THE CALIFORNIA WATER CODE. FOR THAT PURPOSE OF THIS REQUIREMENT, A LEGAL POINT OF DISPOSAL IS DEFINED AS ONE FOR WHICH WASTE DISCHARGE REQUIREMENTS HAVE BEEN PRESCRIBED BY A REGIONAL WATER QUALITY CONTROL BOARD AND WHICH IS IN FULL COMPLIANCE THEREWITH.

8. AFTER NOTICE AND OPPORTUNITY FOR A HEARING, THIS ORDER MAY BE TERMINATED OR MODIFIED FOR CAUSE, INCLUDING, BUT NOT LIMITED TO:

   (A) VIOLATION OF ANY TERM OR CONDITION CONTAINED IN THIS ORDER;

   (B) OBTAINING THIS ORDER BY MISREPRESENTATION, OR FAILURE TO DISCLOSE FULLY ALL RELEVANT FACTS;

   (C) A CHANGE IN ANY CONDITION THAT REQUIRES EITHER A TEMPORARY OR PERMANENT REDUCTION OR ELIMINATION OF THE AUTHORIZED DISCHARGE.

9. IF A TOXIC EFFLUENT STANDARD OR PROHIBITION (INCLUDING ANY SCHEDULE OF COMPLIANCE SPECIFIED IN SUCH EFFLUENT STANDARD OR PROHIBITION) IS ESTABLISHED UNDER SECTION 307(A) OF THE FEDERAL WATER POLLUTION CONTROL ACT, OR AMENDMENTS THERETO, FOR A TOXIC POLLUTANT WHICH IS PRESENT IN THE DISCHARGE AUTHORIZED HEREIN AND SUCH STANDARD OR PROHIBITION IS MORE STRINGENT THAN ANY LIMITATION UPON SUCH POLLUTANT IN THIS ORDER, THE BOARD WILL REVISE OR MODIFY THIS ORDER IN ACCORDANCE WITH SUCH TOXIC EFFLUENT STANDARD OR PROHIBITION AND SO NOTIFY THE DISCHARGER.

10. THERE SHALL BE NO DISCHARGE OF HARMFUL QUANTITIES OF OIL OR HAZARDOUS SUBSTANCES, AS SPECIFIED BY REGULATION ADOPTED PURSUANT TO SECTION 311 OF THE FEDERAL WATER POLLUTION CONTROL ACT, OR AMENDMENTS THERETO.

11. IN THE EVENT THE DISCHARGER IS UNABLE TO COMPLY WITH ANY OF THE CONDITIONS OF THIS ORDER DUE TO:

   (A) BREAKDOWN OF WASTE TREATMENT EQUIPMENT;

   (B) ACCIDENTS CAUSED BY HUMAN ERROR OR NEGLIGENCE; OR

   (C) OTHER CAUSES SUCH AS ACTS OF NATURE,

   THE DISCHARGER SHALL NOTIFY THE EXECUTIVE OFFICER BY TELEPHONE AS SOON AS HE OR HIS AGENTS HAVE KNOWLEDGE OF THE INCIDENT AND CONFIRM THIS NOTIFICATION IN WRITING WITHIN TWO WEEKS OF THE TELEPHONE NOTIFICATION. THE WRITTEN NOTIFICATION SHALL INCLUDE PERTINENT INFORMATION EXPLAINING REASONS FOR THE NONCOMPLIANCE AND SHALL INDICATE WHAT STEPS WERE TAKEN TO CORRECT THE PROBLEM AND THE DATES THEREOF, AND WHAT STEPS ARE BEING TAKEN TO PREVENT THE PROBLEM FROM RECURRING.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

GENERAL MONITORING AND REPORTING PROVISIONS

GENERAL PROVISIONS FOR SAMPLING AND ANALYSIS

Unless otherwise noted, all sampling, sample preservation, and analyses shall conform to the U. S. Environmental Protection Agency approved test procedures for the analysis of pollutants described in Part 136, Volume 38 (No. 199) of Federal Register published on October 16, 1973, or the latest edition of Federal Register, or as approved by the Executive Officer. All analyses shall be performed in a laboratory certified to perform such analyses by the California State Department of Public Health or a laboratory approved by the Executive Officer.

Effluent samples shall be taken downstream of any addition to the treatment works and prior to mixing with the receiving waters.

The discharger shall calibrate and perform maintenance procedures on all monitoring instruments and equipment to insure accuracy of measurements, or shall insure that both activities will be conducted.

A grab sample is defined as an individual sample collected in fewer than 15 minutes.

A composite sample is defined as a combination of no fewer than eight individual samples obtained over the specified sampling period. The volume of each individual sample is proportional to the discharge flow rate at the time of sampling. The sampling period shall equal the discharge period, or 24 hours, whichever period is shorter.

GENERAL PROVISIONS FOR REPORTING

For every item where the requirements are not met, the discharger shall submit a statement of the actions undertaken or proposed which will bring the discharge into full compliance with requirements at the earliest time and submit a timetable for correction.

By January 30 of each year, the discharger shall submit an annual report to the Board. The report shall contain both tabular and graphical summaries of the monitoring data obtained during the previous year. In addition, the discharger shall discuss the compliance record and the corrective actions taken or planned which may be needed to bring the discharge into full compliance with the waste discharge requirements.

CRWQCB, San Diego Region
2/76

GENERAL MONITORING AND REPORTING PROVISIONS

THE DISCHARGER SHALL MAINTAIN ALL SAMPLING AND ANALYTICAL RESULTS, INCLUDING STRIP CHARTS; DATE, EXACT PLACE, AND TIME OF SAMPLING; DATE ANALYSES WERE PERFORMED; ANALYST'S NAME; ANALYTICAL TECHNIQUES USED; AND RESULTS OF ALL ANALYSES. SUCH RECORDS SHALL BE RETAINED FOR A MINIMUM OF THREE YEARS. THIS PERIOD OF RETENTION SHALL BE EXTENDED DURING THE COURSE OF ANY UNRESOLVED LITIGATION REGARDING THIS DISCHARGE OR WHEN REQUESTED BY THE BOARD AND THE REGIONAL ADMINISTRATOR OF THE ENVIRONMENTAL PROTECTION AGENCY. MONITORING RESULTS SHALL BE SUBMITTED ON FORMS PROVIDED BY THE BOARD.

MONITORING REPORTS SHALL BE SIGNED BY:

(A) IN THE CASE OF CORPORATIONS, BY A PRINCIPAL EXECUTIVE OFFICER AT LEAST OF THE LEVEL OF VICE-PRESIDENT OR HIS DULY AUTHORIZED REPRESENTATIVE IS RESPONSIBLE FOR THE OVERALL OPERATION OF THE FACILITY FROM WHICH THE DISCHARGE ORIGINATES;

(B) IN THE CASE OF A PARTNERSHIP, BY A GENERAL PARTNER;

(C) IN THE CASE OF A SOLE PROPRIETORSHIP, BY THE PROPRIETOR;

(D) IN THE CASE OF A MUNICIPAL, STATE OR OTHER PUBLIC FACILITY, BY EITHER A PRINCIPAL EXECUTIVE OFFICER, RANKING ELECTED OFFICIAL, OR OTHER DULY AUTHORIZED EMPLOYEE.

THE DISCHARGER SHALL MAIL A COPY OF EACH MONITORING REPORT ON THE APPROPRIATE FORM TO BE SUPPLIED BY THE BOARD TO:

EXECUTIVE OFFICER
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION
6154 MISSION GORGE ROAD, SUITE 205
SAN DIEGO, CALIFORNIA 92120

REGIONAL ADMINISTRATOR
ENVIRONMENTAL PROTECTION AGENCY
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

ATTENTION: PERMITS BRANCH

Air
let's keep it Clean.
THE SAN DIEGO AIR QUALITY PROGRAM
A regional cooperative effort of the County of San Diego,
Cities of the San Diego Region, Comprehensive Planning Organization,
and Air Pollution Control District.

POLICY ADVISORY COMMITTEE
COMMUNITY RESOURCE PANEL
PROGRAM COORDINATION GROUP

Appendix B

THE SAN DIEGO AIR QUALITY PROGRAM

Local governments in the San Diego County region have undertaken a joint effort to develop, adopt, and implement a Regional Air Quality Strategy (RAQS), to meet federal air quality standards. This effort was begun in 1974 with the establishment of the Air Quality Planning Team and the Air Quality Task Force. The latter is composed of a policy committee of elected officials, a management committee, and a community panel. The Air Quality Planning Team was composed of staff from the participating agencies including the County of San Diego, City of San Diego, Comprehensive Planning Organization (CPO), Air Pollution Control District, and California Department of Transportation. The Team members worked together for 18 months, completed their technical work, and published their report in April 1976 entitled Regional Air Quality Strategies for the San Diego Air Basin. The report set forth three alternative strategies which can meet the national ambient air quality standard for oxidant (smog) in 1985 and maintain it through the year 2000. The report deals with all pollutant sources, both fixed and mobile, and proposes air pollution control tactics which are the most cost effective, regardless of source. The report covers the costs of the strategies, their effectiveness in reducing pollution and in meeting other environmental, social, and economic goals, and a process for continuously monitoring and implementing them--the air management process. Other pollutants dealt with in the report, but in less detail, are sulfur oxides, particulates, carbon monoxide, and nitrogen oxides.

In April 1976, the CPO Board of Directors and the Air Pollution Control Board (County Board of Supervisors) heard a presentation of the final report on the Regional Air Quality Strategy and authorized that presentations on the report be made to local jurisdictions within the region. The object of these presentations was to seek the review of the alternative strategies by local jurisdictions and to seek their approval prior to bringing a final recommendation on a strategy to the CPO Board of Directors and the Air Pollution Control Board for their adoption and subsequent submission to the California Air Resources Board and the Federal Environmental Protection Agency. All 13 cities within the region reviewed the strategies and approved one of them during May and June 1976.

On June 21, 1976, the CPO Board of Directors reviewed the actions taken by its member agencies and unanimously adopted the Regional Air Quality Strategy and Air Management Process (AMP) recommended by the Program Coordination Group, the management committee. At its meeting of August 25, 1976, the Air Pollution Control Board (APCB) discussed the alternative strategies and also adopted the strategy recommended by the Program Coordination Group. However, the Board did not adopt the AMP at that time because it did not agree that the APCB and the cities and CPO should continue to have joint air quality planning responsibility as had existed in the preparation of the RAQS.

☐ Comprehensive Planning Organization–Suite 524 Security Pacific Plaza–1200 Third Avenue–San Diego, CA 92101 (714) 233 5211
☐ Air Pollution Control District–9150 Chesapeake Drive–San Diego, CA 92123 (714) 565-5901

Because of the disagreement on the AMP, the CPO and APCB formed a conference committee of their members to develop an institutional structure for future air quality planning which would be acceptable to both. The conference committee reached agreement on a revised AMP which was adopted by the APCB on December 7, 1976, and the CPO on December 20, 1976. Attached is a copy of the RAQS and AMP as adopted by both Boards. They were transmitted to the California Air Resources Board and the Federal Environmental Protection Agency on December 22, 1976 jointly by CPO and the APCB.

As part of that submittal, it was requested that the Governor of California designate the CPO and APCB as co-lead agencies responsible for preparing the Air Quality Maintenance Plan (AQMP) for the San Diego Air Basin. On February 15, 1977, the Executive Officer of the Air Resources Board (ARB) responded by formally designating APCB and CPO as lead agencies for AQMP development along with the ARB as the agency with state responsibility. He stated that "the mutual agreement by CPO and APCB on a cooperative air management process seems to provide a viable institutional framework for development of the AQMP."

The strategy recommended by the Program Coordination Group (PCG) and adopted by CPO and the APCB is a modification of one of the three alternative strategies prepared by the Air Quality Planning Team. It includes all the tactics in Alternative "B", plus modified versions of two of the tactics from Alternative "A"; namely, (1) vapor recovery at 95%, and (2) coordinated land use and transportation actions. The PCG also recommended an air management process.

The clarification of the vapor recovery tactic is shown in Attachment 3. It suggests that 95% recovery of vapors may be achieved with little or no change in the current regulatory program (which requires 90% recovery), assuming that secondary recovery systems are in fact installed and that the State and Federal requirements for standardized automobile fill pipes are implemented.

The modified land use and transportation process is described in Attachment 4. It proposes to achieve air quality improvements through coordinated land use and transportation actions by local general purpose governments, the Comprehensive Planning Organization, and transit authorities. This proposed process differs from Tactic T1 in Alternative Strategy "A" in that it recognizes the validity of both local general plans and the Regional Comprehensive Plan as officially adopted land use and transportation policies in the San Diego Region and envisions bringing about compatibility of these plans through a cooperative process between local agencies and CPO.

The Air Management Process (AMP) described in Attachment 2 will continue the cooperative interaction that has existed for the last 2½ years of the San Diego Air Quality Program. The AMP provides for implementation of air quality tactics by the jurisdiction with the appropriate responsibility. The three groups that coordinated the preparation and adoption of the RAQS will continue to function during its implementation and refinement. The Policy Advisory Committee (PAC) composed of elected officials and community leaders will monitor the overall RAQS program and submit recommendations for program improvement or implementation modifications to the cities, the County, and CPO. The Community Resource Panel (CRP) consisting of a broad cross-section of public interests and affected public agencies will monitor the implementation of the RAQS and submit recommendations to the PAC. The Program Coordination Group (PCG) composed of a designated representative from the APCD, CPO, County, City of San Diego, and the County-City Managers' Association, will be responsible for monitoring program implementation, pursue resolution of administrative problems, identify needs for revision of the RAQS and commence administrative action to effect such revision. The PCG will also review and coordinate work programs for the implementation and/or revision of the RAQS and for producing the Air Quality Maintenance Plan (AQMP). The process for adopting and amending the RAQS and proposed for adopting the AQMP is shown in Figure 1.

The AMP also describes the functional responsibilities of the cooperating agencies as follows:

1. Comprehensive Planning Organization for the San Diego Region (CPO) - The council of governments for the San Diego Region, the metropolitan planning organization, the regional transportation planning agency, and the A-95 areawide clearinghouse, responsible for implementing transportation management tactics through its member jurisdictions.

2. San Diego County Air Pollution Control District (APCD) - Governed by the Air Pollution Control Board (County Board of Supervisors), responsible for control of fixed sources of air pollution, air pollution monitoring, emissions inventories, meteorological analysis, and operation of air quality models.

3. California Department of Transportation, District 11 (CALTRANS) - Jointly responsible with CPO for transportation planning, regional motor vehicle emissions analysis, and operation of transportation air pollution reduction programs (e.g., carpools).

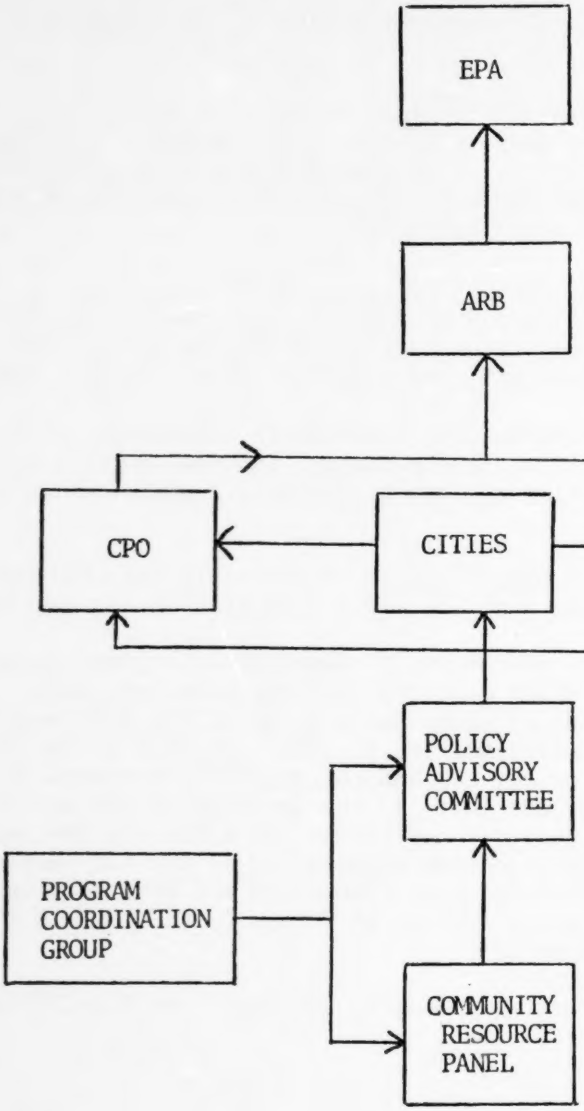
4. Local jurisdictions in the San Diego Region - Responsible for land use control and implementation of some land use and transportation air quality controls.

Concurrently, CPO and the APCD are proceeding to coordinate programs in regional air quality, transportation, and water quality. CPO has been designated as the Areawide Water Quality Planning Agency under Section 208 of the 1972 Amendment of the Federal Water Pollution Control Act (PL 92-500). As part of the work plan for the Areawide Water Quality Program, CPO and the APCD have prepared an air quality element. The element provides for: (1) the development and use of an air pollution diffusion model to evaluate and refine the RAQS; (2) the implementation of the RAQS; and (3) the coordination preparation of the Air Quality Maintenance Plan and the Water Quality Management Plan. CPO and APCD have negotiated a contract for air quality work by the APCD to be funded by $180,300 of the Areawide Water Quality grant to CPO from EPA.

For more information, please contact Mike Aulick, CPO staff, at 714-233-5211 or Mike Sloop, APCD staff, at 714-565-3902.

FIGURE 1

RAQS ADOPTION/AMENDMENT PROCESS



ATTACHMENT 1

PROPOSED REGIONAL AIR QUALITY STRATEGY

TACTIC NUMBER*	TACTIC NAME*
P2	Surface Cleaning
P3, P4	Surface Coating
P9	Gasoline Volatility Reduction
M3	California Emissions Standards for Light Duty Vehicles
M4	California 5/25 Exhaust Emissions Standards and Evaporative standard for Heavy Duty Vehicles
M7, M9	Additional Evaporative Emissions Controls on New Light Duty Vehicles
P1	Dry Cleaners
M1	Inspection and Maintenance of On-Road Vehicles
M5	California Emissions Standards for Street Motorcycles
T3	Communications and Home Goods Delivery
T7	Maximum Bicycle System
A2	Evaporative Controls on New General Aviation Aircraft
M14	Emission Standards for Off-Road Heavy Duty Vehicles Equal to 5/25 Standard for On-Road, Heavy Duty Vehicles

*See Final Report for complete definition of tactics

TACTIC NUMBER *	TACTIC NAME *
T2	Maximum Carpools/Vanpools with Incentives
X2	Home Utilities Engines
P7 **	Gasoline Vapor Recovery at 95%
***	Coordinated Land Use and Transportation Actions

Research into pollutant transport from the South Coast Air Basin is included as a part of this strategy.

* See Final Report for complete definition of tactics

** See Attachment 3, clarification of proposed tactic

*** See Attachment 4, description of proposed process

REVISED ATTACHMENT 2

PROPOSED AIR MANAGEMENT PROCESS AND AIR QUALITY PROGRAM COORDINATION GROUP

Policy Summary

The Regional Air Quality Strategy (RAQS) is a joint effort involving the entire community; the County of San Diego, the cities of San Diego County and the Comprehensive Planning Organization. This attachment is designed to provide a cooperative process wherein each agency in the County which has a functional responsibility for a part of the clean air program will retain authority and responsibility in that functional area.

Technological controls over fixed sources, for instance, are clearly the responsibility of the APCB and authority in this area rests with the APCB. Land use and transportation responsibility is jointly held by the County, the cities, the Port Authority, and the Comprehensive Planning Organization. Functional responsibilities in those areas rest with the respective jurisdictions.

The overwhelming majority of RAQS control tactics are technological controls for which the APCB is lead agency. Once this region has achieved clean air standards, however, it is likely that land use and transportation tactics will take on greater importance in maintaining the standards. Decisions to impose tactics, whether they are technical controls over direct sources of land use and transportation measures, affect each agency in this region.

It is appropriate therefore that an air management process is approved which recognizes lead agency responsibility in keeping with the responsibility and authority that the agency has in a functional area and that the RAQS and this process be jointly submitted to the ARB and EPA by the APCB and the CPO.

Coordination Process

Achieving and maintaining clean air standards requires land use and transportation strategies as well as technological controls over direct pollution sources. The combined strategies and controls will affect all San Diegans, the business community and all local governments. Success of the program requires a system of public involvement and inter-agency coordination. Toward that end, the following management process is designed to assure monitoring of program effectiveness and provide the opportunity for program revision through continued involvement of interested and affected citizens, groups, and local government.

1. The responsibility and authority of existing agencies will be used to carry out the Regional Air Quality Strategy (RAQS); no new agencies will be created.

2. The Air Pollution Control District (APCD) will be responsible for air pollution monitoring: emissions inventorying; meteorological analysis; operation of air quality models; and investigation, implementation, and enforcement of technological controls.

3. The cities in San Diego County, the County of San Diego, the Comprehensive Planning Organization (CPO), the Unified Port District, and other appropriate agencies will include air quality considerations in all land use and transportation actions subject to the California Environmental Quality Act of 1970 (CEQA) by addressing consistency with the RAQS as part of required Environmental Impact Reports.

4. The CPO will be responsible for providing liaison among the cities involved in carrying out and/or updating the Regional Air Quality Strategy. The CPO will be responsible for providing coordination between the Section 208 Water Quality Planning Program and the Regional Air Quality Strategy.

5. The Policy Advisory Committee (PAC), consisting of the Chairman of the CPO Board of Directors, Mayor of the City of San Diego, and two members of the County Board of Supervisors shall continue. The PAC will monitor the overall program of the RAQS and will submit to the cities, the County, and the CPO Board of Directors recommendations for program improvement or implementation modifications.

6. The Community Resource Panel consisting of a broad cross section of public interests and affected public agencies shall continue to function. Filling of vacancies or additional appointments shall be recommended by the Panel and approved by the Policy Advisory Committee. The Community Resource Panel shall monitor the implementation of the RAQS and submit recommendations to the PAC. The Community Resource Panel shall also function as a subcommittee of the Water Quality Program Areawide Planning Advisory Committee.

Air Quality Program Coordination Group

7. An Air Quality Program Coordination Group shall be composed of a designated representative from the Air Pollution Control Board, the CPO, the County of San Diego, the City of San Diego, and the County-City Managers' Association. The Group shall monitor the total air quality program, evaluate the effectiveness of tactics being implemented, identify needs for revision of the RAQS, recommend alternatives for such revision, and assist in intergovernmental coordination and information. The Group will report at least quarterly to the Community Resource Panel and Policy Advisory Committee on the status of program implementation. The Group will also pursue resolution of intergovernmental, air quality strategy administrative problems, and identify needs for revision of the RAQS and recommend alternatives to effect such revision. The Group shall, as necessary, hold joint meetings with the Water Quality Program Management Committee.

8. The work program will be developed by implementing agencies according to functional responsibilities e.g., the APCD will perform a regional air quality impact analysis, the CPO will provide growth projections and prepare long-range transportation plans and coordinate air quality improvement efforts of the affected general purpose governments

and special districts. County and City governments will carry out those actions as needed for which they are lead agency as defined in the RAQS and CEQA.

9. The CPO will appoint one person to act as staff to the Air Quality Program Coordination Group.

ATTACHMENT 3

CLARIFICATION OF TACTIC P7, VAPOR RECOVERY AT 95%

Tactic P7 calls for an increase in the control of vapors in the storage and transfer of gasoline from 90% (present rule) to 95%, in 1985. As indicated in the description of P7 in the Air Quality Planning Team Final Report, it is quite possible that no significant hardware changes would be involved. Processing units that have been tested by the Air Pollution Control District (APCD) indicate that a 95% efficiency or greater can be achieved. The problems with the systems are reliability and collection efficiency at the vehicle.

Reliability is improving as minor technical problems are resolved Reliability can be maintained with an active enforcement program, as planned by the APCD. Finally, the State's 90-day "hands off" and 3-year warranty requirements for certification should further improve the systems.

Efficiency at the nozzle/vehicle interface will also increase, for two reasons. First, both the State and Federal Governments are requiring standardized fill pipes on all vehicles, beginning with 1978 California models. By 1985, 50 to 70% of all vehicles should have standardized fill pipes. Second, there is reason to believe that nozzle technology is not as well developed as it might be and improvement of nozzle design should provide further efficiency in a few years.

Thus, Tactic P7 may be achieved with little or no change in the current regulatory program, assuming that secondary recovery systems are finally installed and standardized automotive fill pipe requirements are implemented.

ATTACHMENT 4

PROPOSED PROCESS FOR COORDINATED LAND USE AND TRANSPORTATION ACTIONS TO IMPROVE AIR QUALITY

General Description

This process proposes to achieve air quality improvements through coordinated land use and transportation actions by local general purpose governments, the Comprehensive Planning Organization (CPO) transit authorities, and the Unified Port District. At the present time, there exists in the San Diego Region a Regional Comprehensive Plan (RCP) including Regional Transportation Plan (RTP) adopted by CPO. There also exists a set of general plans which have been adopted by general purpose local governments. At present there are incompatibilities which exist between these plans which interfere with the attainment and maintenance of clean air standards.

This proposed process recognizes the validity of both local general plans and the RCP as officially adopted land use and transportation policy in San Diego. This proposed process envisions modifications to both general plans and the RCP so as to achieve consistency of purpose and achieve air quality benefits.

Compatibility among these plans and policies would be brought about by a cooperative effort between local agencies and CPO wherein incompatibilities adversely affecting air quality are jointly identified, appropriate changes determined, and then these changes proposed to local agencies or CPO as appropriate. If, after considering the proposed changes, actions by CPO and local agencies do not resolve incompatibilities which interfere with achievement or maintenance of clean air standards, then the local agency plan may nevertheless be effectuated if the local agency adopts it by at least a 2/3 vote.

This proposed land use and transportation process includes formulation of an air quality impact assessment methodology for analyzing proposed changes to general plans or changes to the RCP. The Air Pollution Control District is currently formulating such a methodology with the assistance of CPO.

If there is regional approval of this land use and transportation process then a change to State law may be sought if needed.

Appendix C

AD HOC ADVISORY COMMITTEE ROSTER

ORGANIZATION	REPRESENTATIVE(S)
Members	
American Public Works Association	William E. Blakesly
American Society of Civil Engineers	William Catlin
Building Contractors Association	Al Hogan - Vice-Chairman
California Council of Civil Engineers and Land Surveyors	Norris E. Luedtke
Citizen	Dr. H. M. Davisson
Citizen	Ivan McDougal
Citizen	E. T. Miller
Citizen	Charles R. Riefstahl
Citizen	Oliver Stanley
Citizen	A. D. Trotter
Citizen	Dortha Trotter
Citizens Coordinate for Century 3	Diane Barlow Jim Coatsworth - Chairman
Comprehensive Health Planning Association	Jim Hill
San Diego Chamber of Commerce	Harold Arfman
San Diego Coast Watch	Partick O'Connor
San Diego Construction Industry Advancement Fund	Stanley Scott
U.S. Navy Command Assistant for Environmental Protection Matters	Tom Stone
Advisory Public Agencies	
City of San Diego	Art Attebery Mel Aubery
County of San Diego	Joseph N. Barry Ira Cotton
San Diego Coast Regional Coastal Conservation Commission	Dan Gorfain
San Diego Regional Water Quality Control Board	Ladin Delaney
11th Naval District	Villi Jepsen

AD HOC ADVISORY COMMITTEE ROSTER
(Cont'd)

ORGANIZATION	REPRESENTATIVE(S)
Observers Receiving Correspondence	
California Coastal Zone Conservation Commission	Joseph E. Bodovitz
Citizen	Tony Ayers
Citizen	Dr. C. F. Cooper
City of San Diego, Water Utilities Department	Richard W. King
Environmental Protection Agency	Jim McGrath
State Water Resources Control Board	Ray Walsh
Councilman Martinet	Bill King
Department of Environmental Quality, City of San Diego	David Moss
Lesser San Diego County, Zero Population Growth	Mignon Scherer
Local Agency Formation Commission	Chuck Hungerford
San Diego Coast Watch	Stan Eller
San Diego County Labor Council	R. Richardson
Sentinel News	Alison DaRosa
Reminder Newspapers	Jackie Dewie
Comprehensive Planning Organization	George Ream
State Health Department	Sam Kalichman

APPROVAL OF SUMMARY STATEMENT OF FINDINGS AND RECOMMENDATIONS FOR THE FACILITIES PLAN STUDY

DATE: 11 June 1975

YES VOTES: Unanimous

NO VOTES: ____________________

Jim Coatsworth, Chairman
Ad Hoc Advisory Committee

TO: The Consultants to the City of San Diego: The Metropolitan Waste Water Treatment Facilities Plan

FROM: The Citizens Ad Hoc Advisory Committee to the Consultants

SUBJECT: Draft Resolution of the Ad Hoc Committee: Plant Sitings and Peripheral Findings

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INTRODUCTION

In compliance with requirements of the California Coastal Zone Conservation Commission for public participation in the municipal waste water treatment facilities plan study, a public meeting was held in January 1975. The purpose of this meeting was to form an Ad Hoc Committee of citizens connected with: (1) concerned agencies and jurisdictions, i.e., the U.S. Navy, County of San Diego, or (2) organizations representative of the private sector, i.e., the Building Contractors Association, the San Diego Chamber of Commerce, (3) representatives of conservationist groups, i.e., Citizens Coordinate for Century 3, San Diego Coastwatch, and (4) concerned private citizens. The resultant group included members of ten organizations, public and private, and 7 private citizens. Five advisory agencies were represented, and thirteen additional groups, agencies, or individuals received correspondence of the proceedings.

COMMITTEE RESPONSIBILITIES:

The Ad Hoc Committee was specifically charged by the Coastal Commission to consider: (1) all feasible sites for waste water treatment within the coastal zone, and (2) to consider the ultimate population to be served by the metro sewage system. In addition, the Committee considered a wide range of peripheral subjects integral to the above points.

Preliminary to any decision-making process by the Committee, an intensive briefing was conducted by members of the consultants team, cooperating specialists and advisory agency staff. This effort was essential to fruitful deliberations later, and the true complexity of the overall problem became increasingly apparent in the course of the presentations. The findings and recommendations of the Committee are intended as advisory for the consultants in the preparation of their plan for the City of San Diego.

Included herewith are the summary of deliberations of the Committee, recommendations on the siting of treatment plants and other facilities, and peripheral findings.

COMMITTEE DELIBERATIONS:

The Committee met initially at two week intervals. The volume of work and the urgency of deadlines caused a shift to weekly meetings, which were held over a two-month period. Subject areas researched and discussed included the following:

(1) The geographical extent of the planning area.

(2) Determination of growth parameters to be used in the facilities plan study, population size and distribution of the specific data to be used in projections for the study.

(3) Size, layout, location, function of the present Point Loma facility.

(4) Effects of primary discharge on the marine environment at Point Loma.

(5) Federal (EPA) and State (WQCB and Coastal Conservation Zone Commission) requirements, conditions, and projections.

(6) Treatment alternatives to present primary treatment, including conformance to (5) above, methods, size requirements, plant access needs, social, aesthetic, and environmental impacts, and costs.

(7) Water reclamation possibilities, including projected demand, costs and quality of imported water, location of plants, and possible restoration/improvement/maintenance projects utilizing reclaimed water.

(8) Impact on localized ocean areas, size, costs, and needs related to present and projected/contemplated ocean outfalls.

(9) Sludge treatment: location, uses, volumes, etc.

(10) The pumping/treatment/discharge of potentially disastrous overflow volumes from Tijuana.

Candidate sites were proposed and examined, specifically with reference to items (6), (7) and (10) above. A one-day field trip was conducted to allow for on-site inspection and briefing for 13 sites throughout the study area.

The Committee researched, discussed, prepared and presented at a scheduled public hearing a statement summarizing the Committee consensus on the need, areas of concern to be addressed, and appropriate designated agencies to plan and to implement proposals included in Section 208 of Public Law 92-500.

Although this effort detracted from the Committee's work on its assigned goals, it was felt that the Committee, currently deeply involved in Section 201 (facilities planning), was probably more aware as citizens of some of the problems connected with Section 208 planning, and could make a useful and necessary input to the State, in the public hearing process.

The Committee encountered substantial difficulty in deciding on a consistent and objective method of evaluating the proposed sites. To this end, several evaluation methodologies were advanced. These are outlined below with their associated criteria.

1. Weighted Scoring Method
   - (a) Engineering criteria
   - (b) Socio-environmental criteria

Two alternate assumptions were used in applying this method, namely; (a) additional plant construction at present site, and (b) abandonment of existing site except for outfall. Seven (7) of the eventual thirteen (13) sites were included in this analysis.

2. Kepner-Tregoe Weighted Scoring
   - (a) "must" criteria
   - (b) "want" criteria

Failure to satisfy a "must" criterion, such as federal and state requirements, disqualifies the alternative. Choice is made by rating compliance with "want" criteria, i.e., cost of plant, on a numerical sliding scale.

3. Alternative Methods of Treatment Rated by Criteria Compliance
   - (a) Ocean impact of primary treated effluent.
   - (b) SWRCB Ocean Plan
   - (c) EPA 1977 Secondary Treatment Standards
   - (d) Sludge handling to meet coastal zone permit conditions.
   - (e) Protection from Tijuana emergency overflows.
   - (f) Waste water use.

(g) Land application.

  (1) overland flow
  (2) ground water percolation
  (3) Live-stream maintenance

(h) "No" Project" for each individual alternative rated according to the above criteria.

A total of twenty-four (24) alternatives were included in Section 3.

4. Modified Binary System

(a) Federal and state requirements
(b) Tijuana overflow problems
(c) Site size
(d) Site location
(e) Cost
(f) Reclamation capability
(g) Planning flexibility
(h) Utilization of existing facilities

This was a result of the site inspection trip. A 0-1/2-1 point scale was used. An immediate result was the elimination of five (5) "sensitive" sites, all in existing residential or recreational areas.

The Committee next examined the list of grouped treatment alternatives (Section 3, pages (4) and (5)). For ten of the alternatives, included in 3a, b, and c, cost data was prepared at the Committee's request, to include for each alternative: cost of plant; cost of land; cost of piping; cost of outfall, where necessary to the alternative. Estimates of operation and maintenance were made as a function of the degree of utilization of present facilities, plant location and plant size. These cost data were in the nature of "yardsticks" for evaluation of the alternatives. The data were included in "Decision Analysis Worksheets" which allowed comparison of the treatment alternatives evaluated by the Kepner-Tregoe weighted scoring method (Section 2, page (4))

The decision-making process which then followed involved: (1) consideration of successive alternatives which might qualify as the "first" recommendation of the Committee; rejection of a given alternative thus did not disqualify from any further consideration, but did eliminate it as the first performance. Although the Committee, after reviewing the effects of primary waste treatment discharge to the ocean, questioned the need for secondary treatment of this discharge, it was felt necessary to assume no choice in the satisfaction of 1977 EPA requirements. This first preference, then, had to take into account both these requirements and the projected daily volume to be treated, 200 million gallons; (2) recommendations for plant location, the overall problem of Tijuana sewage treatment and disposal, water reclamation, and sludge handling.

COMMITTEE RECOMMENDATIONS:

(1) A. That the Comprehensive Planning Organization population growth data, projected to the year 2000, be utilized for purposes of the facilities plan study.

B. That the metropolitan service area to be planned for be bounded by and include Del Mar and Poway on the north, Lakeside, Alpine and the Otay Lakes on the east; Tijuana and the Rodriguez Reservoir area on the south; and the Pacific Ocean on the west. It should be specifically noted that the southern boundary was established for reasons of emergency sewage overflow planning only, and is not intended to imply or suggest any effort by the Committee to involve itself in international planning or policy making.

(2) The Point Loma site be retained, with the outfall, for a maximum treatment facility of 100 to 120 MGD of secondary treated effluent. Expansion of the Point Loma site beyond the present enclosure, into Navy property immediately to the north was rejected unless no other alternative remained for consideration. Utilization of other property, formerly part of the California Western University campus, even further north and non-adjacent or contiguous, was rejected.

(3) A "super satellite" plant be established at a site other than Point Loma, with a treatment capability of 80-100 MGD, and a treated-water main connection with the existing Point Loma outfall. The preferred general location for this plant was Loma Portal-Midway area (west and north of Lindbergh Field), with the specific site considered "first among equals" roughly bounded by Midway Drive., Barnett Avenue, Pacific Highway, Kurtz Street, and Rosecrans Street. The location lends itself to pumping of treated water to inland locations north, east, and south for reclamation.

(4) Proceed with identification of and ultimate establishment of as many as 8 small reclamation plants, with 2 to 15 MGD capacity, located to provide reclaimed water for irrigation and other purposes to specific areas, i.e., Santee-Lakeside, Balboa Park, the Tijuana Valley, Otay Mesa, Grantville, and Mission Bay Park. The timing of construction of reclamation plants would be governed primarily by the development of suitable uses for reclaimed water.

(5) If the necessity of providing for full treatment/disposal of a projected volume of waste water from Tijuana of 100-110 MGD is finally judged to be of critical planning

importance and/or joint U.S.-Mexico agreement is reached on a major South Bay facility, the preferred site, among four examined in the Tijuana Valley, is one bounded by I-5, Sunset Street., and 27th Street, in the east end of the Valley. This is of course also suitable for a smaller reclamation plant. The environmental-social-cost impacts of this site were felt to be minimal compared to the other alternatives.

ANCILLARY CONSIDERATIONS:

The specific problem of where to locate future sludge drying beds was not addressed, except as follows. Of the alternatives of either pumping it out the outfall or pumping to a land location, dewatering and treating for use as a soil amendment material, the Committee favored the latter. The Committee also, in its vote to eliminate from further consideration by present Fiesta Island site (now used for sludge treatment), at least by implication rejected the continuation of sludging operations there. Other sites, i.e., Camp Elliott, are probably available within the study plan area.

The Committee, for aesthetic as well as coastal zone regulations, was not in favor of further development of waste water treatment facilities in the immediate vicinity of the coast, if any reasonable alternatives are available. The continued use of the Point Loma facility is very much a cost-benefit oriented decision, and limits were placed on this, i.e., size of plant and maximum treatment volume.

Water reclamation on a large scale was favored, particularly as a long-term goal. This becomes increasingly attractive if: (a) the costs of imported water continue to increase; (b) agriculture continues to be of economic importance in the San Diego Region; (c) regulations concerning the level of treatment and the uses to which waste water may be put are made less stringent, or (d) it becomes increasingly urgent to build large outfalls either in the south or in the north for the ocean dumping of waste water.

The feasibility of very large scale water storage, as an alternative to ocean dumping of excess treated water during times when the demand for reclaimed water declines, was considered but not pursued at any length. Such possibilities, especially in the event of (c) above, need consideration, but do not constitute a recommendation of the Committee.

The sub-committee charged with the preparation of this resolution wishes to record its awareness of the recent new working agreement between HUD and EPA, with respect to land use planning coordination for HUD 701 program funds and EPA Section 208 waste treatment program planning. We would be interested in whatever long-term effects this agreement may be apt to generate for the present planning effort. The sub-committee also wishes to note the recent designation of the Comprehensive Planning Organization as the 208 planning agency in the San Diego Region.

The Committee wishes to extend its appreciation to the consultants and to their associated advisors and specialists for their efforts in behalf of the Committee's deliberations. We hope and trust that these will prove of merit and assistance in the difficult and complex task embodied by this plan study. We commend the consultants for their thoroughness and diligence and extend our thanks for the chance to participate in this enlightening process.

Appendix D

Selected Pages From:

QUANTITATIVE RESPONSES OF DEMERSAL FISH AND BENTHIC INVERTEBRATE COMMUNITIES TO COASTAL MUNICIPAL WASTEWATER DISCHARGES

Volume 1. Final Report

by

Alan J. Mearns, M. James Allen, Lucinda S. Word
Jack Q. Word, Charles S. Greene
Marjorie J. Sherwood, and Brad Myers
Southern California
Coastal Water Research Project
El Segundo, California 90245

EPA Grant R801152

Project Officer

Richard Swartz
Pacific Northwest Water Quality Laboratory
National Environmental Research Center
Corvallis, Oregon, 97330

Prepared for

NATIONAL MARINE WATER QUALITY LABORATORY
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CORVALLIS, OREGON

Point Loma Coastal Shelf; City of San Diego, Point Loma Treatment Plant

Since 1963, the staff of the Point Loma Treatment Plant has conducted benthic surveys offshore of the Point Loma Peninsula. The station grid has had some minor changes, but basically remains the same to the present time (see Figure A-7).To date, there have not been trawl surveys conducted by the City of San Diego in this area.

Four replicate grab samples were taken with a 0.121 sq m modified Petersen grab device at each of the 17 stations. The sampling grid consists of 13 stations located within approximately 2.0 km of the outfall diffuser at depths of 45, 62, and 78 m. Four control stations (3 are 10 km to the north and one is 10 km to the south) are also sampled. Material retained on a 1 mm mesh screen from each site was sorted, the species identified and counted. A wet weight of organisms was also recorded. Measurements of BOD, COD, and nitrogen levels within the sediments were made on core samples taken at the same stations.

The data collected from these surveys has been periodically reviewed (cite S.D. reports). However, our own recent surveys completed in winter and summer of 1975 form the basis of our analyses.

Point Loma Trawl Surveys

Prior to 1975 there had been no nearshore demersal fish surveys off Point Loma. On 12 February and 10 September 1975 we conducted two surveys using a 25 foot otter trawl with ½ in cod-end mesh. Eight stations, ranging in depth from 61 to 137 m were sampled on 12 February; on 10 September we surveyed nine sites ranging in depth from 33 to 88 m (Figure 5). The R/V Sea Quest (Lockheed Aircraft Services, San Diego) was used for each survey.

The trawl (Willis 7.6 m headrope) was towed for 10 minutes (on bottom time) at 1.3 m/sec along constant depth contours at each station. Fishes and invertebrates were then sorted, identified, and counted. Fish were measured (to nearest centimeter size class for abundant species or to nearest millimeter for low abundance species) and weighed by species. All fish were examined for deformities, parasites, and signs of disease (fin erosion and tumors) ....

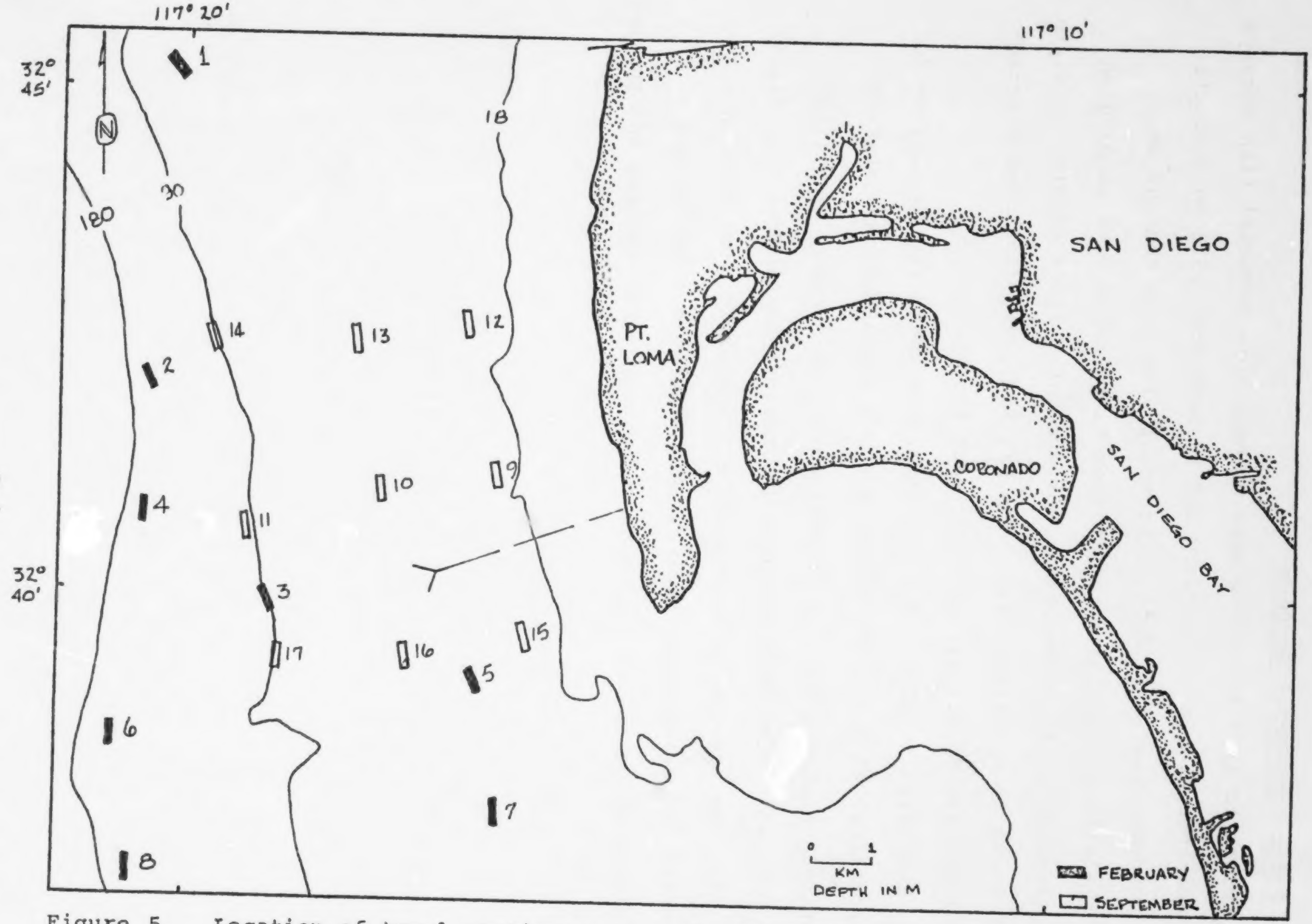


Figure 5. Location of trawl stations surveyed off Pt. Loma during February and September 1975.

Conditions at the Point Loma Shelf

Benthis campling has been underway for nearly 15 years at the discharge site off Pt. Loma. In our 1973 report, we reviewed data demonstrating the response of the benthos to a period of digested sludge discharge (September 1964 to January 1967) and a second period of raw sludge discharge (August 1968 to January 1969). Chen, Orlob and Smith (1972) reported that the digested sludge stimulated both variety and abundance of infauna, with declines following termination. Both Chen *et al.* (1972) and SCCWRP reported that brittle stars (*Amphiodia urtica*) were most inhibited by the two episodes. Stations to the north showed greater responses than to the south with major enhancements occurring in *Parvilucina tenuisculpta*.

During 1975, average survey values for biomass and abundance were low, but number of species high, relative to the areas off Orange and Los Angeles Counties. Our calculations indicate 1975 biomass for the Pt. Loma area averaged 28.2 g/m^2 in winter (Jan. - April) and 20.6 g/m^2 in summer (July), with abundance averaging 1,420 and 1,208 animals/m^2 respectively.

More detailed analyses of the recent surveys indicate that conditions of biostimulation are continuing to occur 1.6 to 3.2 km to the north and south of the diffuser and conditions of depressed abundance and biomass within .8 km on either side of the diffuser (Table B5). However, these conditions are not simple to explain: the control station 10 km south of the diffuser (B1) was very low in terms of biomass, abundance and concentration of brittle stars (*Amphodia urtica*), while the control station

10 km to the north (B-3) demonstrated the reverse. Both demonstrated similar levels of BOD (1.3 - 1.4 g/kg) and COD (14 - 17 g/kg) relative to outfall stations. Thus, over the 20 km distance, there appeared to be a trend of increasing biomass and abundance, upcoast interupted by the outfall-related regions of depression and biostimulation.

Three species showed important patterns. *Parvalucina tenuspeculata* was abundant at all stations ($150 - 500/m^2$) at the 62 m isobath, but was particularly enhanced at a site 1.6 km south of the diffuser (A -8; Table B5). *Amphiodia urtica* was abundant at the north control site (B-3) but not the south (B-1). Approaching the outfall from both directions, *Amphiodia* decreased in abundance and generally appeared depressed over an area of about 3 sq km surrounding the diffuser.

Earlier we reported that low ratio of abundances of *Amphiodia urtica* and *Parvilucia tenuisculpta* appeared to be good indicators of benthic response at this site (SCCWRP, 1973). As indicated at the bottom of Table B-6, low ratios (i.e., less than 1:1 continue to occur at all 62 m stations except the north control (B-3). Historically (eg., 1963) there were over 20 *Amphiodia* for every *Parvilucina* throughout the survey area except station B - a, 10 km to the south. The major trend of decreasing ratios occurred prior to 1966 (note station a - 5 and A - 2) but has continued.

A second pelecypod, *Axinopsida serricata,* while not obvious at other discharge sites, was an important indicator at Pt. Loma. As seen in Table *Axinopsida* was markedly enhanced at the station 3.2 km to the north of the diffuser (A-5), but only

Table B-6. Summary of benthic infaunal parameters for a winter, 1975, survey off Pt. Loma, California, with historical comparison of Amphiodia/Parvilucina ratios (see SCCWRP, 1973); Refer to Figure for station locations. Replicates = 4.

Station Distance from outfall (km)	B-3 10N	A-5 3.2N	A-9 1.6N	A-16 .8N	A-15 .8S	A-8 1.6S	A-2 3.2S	A-1 10S
Abundance, No./m^2	2054	1758	1310	1100	1041	2148	1610	981
± St.Dev.	684	388	357	348	281	2046	422	580
Biomass, g/m^2	54.1	44.6	30.1	10.4	25.2	26.7	36.8	18.9
± St.Dev.	23.4	4.7	14.1	9.4	6.2	8.7	8.9	4.4
No. Species/sample	53.5	48.8	47.3	36.5	37.0	45.5	47.5	59.8
± St.Dev.	10.4	2.2	8.9	3.8	4.0	2.5	7.8	4.9
B.O.D., g/dry kg	1.31	2.91	1.83	4.07	3.33	2.76	3.09	1.35
C.O.D. g/dry kg	17.4	N.D.	21.8	23.7	22.7	21.7	20.0	14.2
Abundance of (No./m^2):								
Aphhiodia urtica	554	3.6	27	4.3	6.5	70.8	108	2.1
Parvilucina tenvisculpta	165	221	222	234	252	394	167	146
Axsinopsida serricata	150	254	60.2	16.7	77.1	85.3	92	52
Ratio: Amphiodia/Parvilucina								
1964, January	22	36	-	-	-	-	71	.25
1966, January	121	2.6	.10	.003	.008	1.4	14	.07
1972, July	4.2	5*	.45**	-	-	.32	1.5	1.0**
1975, January	3.4	.17	.12	.018	.026	.180	.647	.014

* No Parvilucina; number of Amphiodia given

** No Amphiodia taken; 1/ No Parvilucina given moderately so 3.2 km to the south (A - 2).

At present, it appears that the Point Loma discharge is influencing infauna primarily along the 62 m isobath; there is a tendency toward a zone of depressed biomass and abundance at within 1 km radius of the diffuser but unlike other sites, it is not characterized by loss of Parvalucina or appearance of Solemya johnsoni which seems to prefer sludge - like deposits. Sludge particles are not apparent in the samples, suggesting that some recovery from th 1968-69 raw discharge episode has occurred. This may be reflected in the presence, although not in great numbers, of Amphiodia urtica at all stations. It is also likely that station as close as 500 m from the diffuser are too close to receive the impact of sustended solids; they may be falling out at greater distances, both to the north and south, depending on flow.

In any case we estimate that the area primarily influenced by discharge at Pt. Loma and in the order of 4 sq km. It is still difficult to judge whether or not recovery from sludge discharge has occurred or whether present effects are due only to present discharge conditions. The absence of sludge-like material in the grabs and absence of Solemya suggest the area is not presently affected by sludge-like deposits.

Conditions on the Point Loma Shelf

The Coastal Water Research Project conducted two trawl surveys near the Point Loma outfall, one during February,1975 (Voglin, 1975) and one in September, 1975 (see chart, Figure 13). A total of 42 species of fish have been collected. Relative to other coastal areas, trawls at Pt. Loma produced catches of moderately low abundance (97 fish per haul), biomass (5.5 kg/haul) and species (9.9 per haul), but moderate diverstiy (1.28). While additional suveys are necessary to characterize the effects, if any, of the outfall, it appears that stations near and inshore of the diffuser (between 35 and 60 m) were generally higher in abundance, species and diversity, than for the area in general (250 - 300 fish, 13 - 15 species, Brilloun diversity of 1.5). English sole were abundant near the outfall (offshore in February and inshore in September). Pacific sanddabs were moderately abundant in the area. While all major bottom fishes were present, there was a notable lack of schooling perciform fishes inshore.

Fish bearing parasites and tumors were taken, but none with fin erosion diseases.

COMISION ESTATAL DE SERVICIOS PUBLICOS DE TIJUANA

~~RIO SUCHIATE No. 701 COLONIA REVOLUCION~~ TELS. ~~6-14-50 6-51-01 02 03 04 05~~

Centro de Gobierno,
Vía Oriente No. 1,
Río Tijuana,
Tijuana, B.C.

3-12-01 al 05

NUM. 3851
SECCION GERENCIA
EXPEDIENTE

11 de mayo de 1977.

MR. STAN MELLIN.
564 Howard St.,
SAN FRANCISCO, CALIF. 94105

Me refiero a su atenta comunicación de fecha 27 del mes de abril próximo pasado relacionada con el crecimiento demográfico futuro de la Ciudad de Tijuana que será un factor que afectará en forma significativa la proyección y planeación en el área metropolitana de San Diego.

En la actualidad para el área de Tijuana se han utilizado dos criterios para estimar las proyecciones probables, la primera ajusta la población censada en 1970 de 340,583 a 374,378 al estimarse que hubo personas no censadas al encontrarse estas fuera de la Ciudad o por deficiencias del personal encargado del Censo, estimándose un crecimiento futuro de 6.88% anual de los cuales el 3.7% corresponde a crecimiento natural y el 3.1% a crecimiento por inmigración de otros Estados de la República Mexicana, dando como resultado una población para 1990 de 1'418,204 habitantes con una población flotante o turística promedio de 82,191 visitantes diarios con máximos probables de 150,000.

El segundo criterio para determinar el crecimiento probable de la población hasta 1990 consiste en considerar la población censada en 1970 como correcta sin ajuste alguno, por lo que siguiendo este criterio, en 1990 la población fija suma 1'017,200 habitantes con un promedio de 78,125 visitantes que darían una población total de 1'094,325 personas que representan un crecimiento con tasas decrecientes aproximada de 6 al 4% durante el período 1970 - 1990 que se estima bajo, si se toma en cuenta que las tasas de crecimiento de 1940 a 1970 han registrado máximas de 11.52% y mínimas de 6.91% anual.

En 4 hojas anexas se muestran los datos relativos a las dos proyecciones.

Espero que la información que me permito anexarle le sirva para desarrollar su trabajo.

Atentamente,
COMISION ESTATAL DE SERVICIOS PUBLICOS DE TIJUANA,
EL GERENTE GENERAL,

ING. JUAN OJEDA ROBLES.

COMISION ESTATAL DE
SERVICIOS PUBLICOS DE
MAY 12
TIJUANA, B. CFA., MEXICO

JOR/cbp.

AL CONTESTAR ESTE OFICIO FAVOR DE CITAR LOS DATOS CONTENIDOS EN EL ANGULO SUPERIOR DERECHO

1er. Criterio.

RESUMEN DE POBLACION REGISTRADA DE 1930 A 1970 E INCREMENTO PREVISTOS PARA PERIODO 1970-1990

AÑO	CENSO	AUMENTO	
		NUMEROS	POR CIENTO
1930	11,291	- -	- -
1940	21,977	10,686	67.04 %
1950	65,364	43,387	114.44 %
1960	165,690	100,226	153.34 %
1970	374,388	208,698	125.96 %
1980	728,669	354,281	94.6 %
1990	1'418,204	689,535	94.6 %

* Población Prevista con 6.886% de incremento anual.

Censo 1970; 340,583 habitantes, ajustado a 374,388, aumento que se estima justificado para fines de proyección al efectuarse muestreos que indicaron deficiencias aproximadas del 10% en dato censal.

POBLACION

AÑO	POBLACION FIJA	FLOTANTE	TOTAL.
1927	8,394		8,394
1930	11,271		11,271
1940	21,977		21,977
1950	65,364	21,850	87,214
1960	165,417	26,810	192,227
1970	374,378	32, 878	407,264
1980	728,669 *	53,544 *	782,213 *
1990	1'418,204 *	82,191 *	1'500,395 *

* Población Estimada

Nota:

Es importante hacer notar que la población flotante en días festivos Norteamericanos excede de 150,000 visitantes en un solo día.

Censo 1970; 340,583 habitantes, ajustado a 374,388, aumento que se estima justificado para fines de proyección al efectuarse muestreos que indicaron deficiencias aproximadas del 10% en dato censal.

2do. Criterio

Crecimiento Demográfico Tijuana , Baja California.

1930 - 1970

Evolucion de la población de Tijuana

Año	Población	Incremento Porcentual	Tasa de crecimiento
1930	11 271		
1940	21 977	183.49	6.91
1950	65 364	297.42	11.52
1960	165 690	253.48	9.75
1970	340 583	205.55	9.47

Proyección Aceptada

Población de proyecto para el acueducto Río Colorado-Tijuana
habitantes

Tijuana Año	Fija	Flotante	Población Total
* 1970	*340 583	32 000	372 583
1971	360 000	33 600	393 600
1972	387 000	35 200	422 200
1973	412 000	36 800	448 800
1974	488 000	38 400	526 400
1975	470 481	40 000	510 481
1976	495 000	42 000	537 000
1977	525 000	44 000	569 000
1978	557 000	46 000	603 000
1979	595 000	48 000	643 000
1980	620 039	50 000	670 039
1981	656 000	52 500	708 500
1982	592 000	55 000	647 000
1983	728 000	57 500	785 500
1984	760 000	60 000	820 000
1985	805 310	62 500	867 810
1986	845 000	65 625	910 625
1987	892 000	68 750	960 750
1988	930 000	71 875	1'001 875
1989	975 000	75 000	1'050 000
1990	1'016 200	78 125	1'094 325

* Censo Oficial 1970
Flotante real promedio diario Turistas Máximos diarios 150,000 personas.

Población por Edades y Sexo mostrando el % según Censo 1970

Edad desplegada en el municipio de Tijuana según el censo de 1970

Características generales	Hombres	Mujeres	Total	% del total
Total	169 317	171 266	*340 583	
De 0 a 4 años	29 406	27 637	57 043	16.74
De 5 a 9 años	28 021	27 001	55 022	16.15
De 10 a 14 años	23 229	22 695	45 924	13.48
De 15 a 19 años	17 153	18 648	35 801	10.51
De 20 a 24 años	13 255	15 919	29 174	8.75
De 25 a 29 años	11 044	12 301	23 345	6.85
De 30 a 34 años	9 639	10 197	19 836	5.82
De 35 a 39 años	9 247	9 164	18 411	5.41
De 40 a 44 años	7 736	7 767	15 103	4.43
De 45 a 49 años	6 609	5 603	12 212	3.59
De 50 a 54 años	4 337	4 132	8 469	2.49
De 55 a 59 años	3 255	3 208	6 463	1.90
De 60 a 64 años	2 344	2 661	5 005	1.47
De 65 a 69 años	1 761	2 013	3 774	1.11
De 70 a 74 años	1 124	1 242	2 366	0.69
De 75 a 79 años	551	651	1 202	0.35
De 80 a 84 años	327	419	746	0.22
De 85 años y más	279	408	687	0.20

*Censo Oficial 1970

APPENDIX F

BACKGROUND INFORMATION ON AIR POLLUTION

Introduction

Any detailed discussion of air pollution issues requires an understanding of terms and phrases which are used in a technical or semi-technical sense. It is especially important to understand the distinction between air pollutant emissions and ambient air quality. The term "pollutant emissions" refers to the quantity of one or more specific compounds introduced into the atmosphere by a given source (or group of sources) during a specified time period. The term "ambient air quality" refers to the concentration (quantity per unit volume) of a specific compound in the atmosphere which results from the interaction of pollutant emissions, physical processes (meteorology) affecting the distribution of these pollutants, and chemical reactions in the atmosphere involving these pollutants. Thus, emissions represent the rate (amount per unit time) at which pollutants are added to the atmosphere, while air quality is the concentration (amount per unit volume of air) of a pollutant actually experienced at a particular geographic location.

It is customary to identify air pollutants either as specific chemical compounds (such as carbon monoxide [CO], nitric oxide [NO], nitrogen dioxide [NO_2], hydrogen sulfide [H_2S], sulfur dioxide [SO_2], sulfuric acid [H_2SO_4], ozone [O_3], hydrogen fluoride [HF], ethylene [C_2H_4], lead [Pb]) or as certain groups of compounds (such as total oxides of nitrogen [NO_x], oxides of sulfur [SO_x], photochemical oxidants [O_x], suspended particulates or aerosols, nitrates [NO_3^-], sulfates [$SO_4^{=}$], organic gases or hydrocarbons [HC]). As indicated above, some pairs of terms are often used interchangeably. The terms "aerosols" and "suspended particulate matter" are generally used as synonyms. Likewise, the terms "hydrocarbons" and "organic gases" are often used interchangeably. The term "organic gases" is usually more appropriate from a strictly technical standpoint than is the term "hydrocarbons".

Air pollutants, such as those identified above, are often categorized as being "primary" or "secondary" pollutants. Primary pollutants are those (such as CO, NO, H_2S, most SO_2, HF, Pb, and various aerosols and organic gases) which are emitted directly into the atmosphere. Secondary pollutants are those (such as most NO_2, H_2SO_4, O_3, NO_3^-, $SO_4^{=}$, and many aerosols and organic gases) which are produced from primary pollutants or other secondary pollutants by chemical reactions in the atmosphere. These chemical reactions may also involve compounds which are normal components of the atmosphere. Compounds which readily participate in such chemical reactions are often categorized as "reactive pollutants".

On a global scale, natural sources produce far greater quantities of most pollutants than do human activities. Yet because these natural sources are far less concentrated than human activities, they exert little impact on ambient air quality (Table A).

Meteorology

Meteorological factors are important to consider from several perspectives when evaluating air quality issues. Factors such as temperature, humidity, and the intensity and duration of sunlight play important roles in governing the nature and rate of chemical reactions in the atmosphere. Atmospheric turbulence, wind patterns and vertical temperature gradients are important factors governing the distribution and dispersion of pollutants. Atmospheric turbulence, wind patterns and precipitation processes affect the rate at which pollutants are removed from the atmosphere. Figure A summarizes the major structural features of the atmosphere.

Temperature Inversions

Under "normal" conditions, sunlight warms land surfaces which in turn heat the air at ground level by conduction and re-radiation of heat. When heated sufficiently, a pocket or "cell" of warmed air will expand and rise, being displaced by cooler, denser air from above. As it rises, the cell of warm air will expand further due to decreasing atmospheric pressure. This expansion due to decreasing pressure at higher altitudes causes the temperature of the air cell to drop. The air cell will continue to rise, expand in volume, and cool until it reaches an altitude where it is at the same temperature and pressure as surrounding air masses. This rising of warmed air and replacement by cooler air from above results in vertical mixing of the air column.

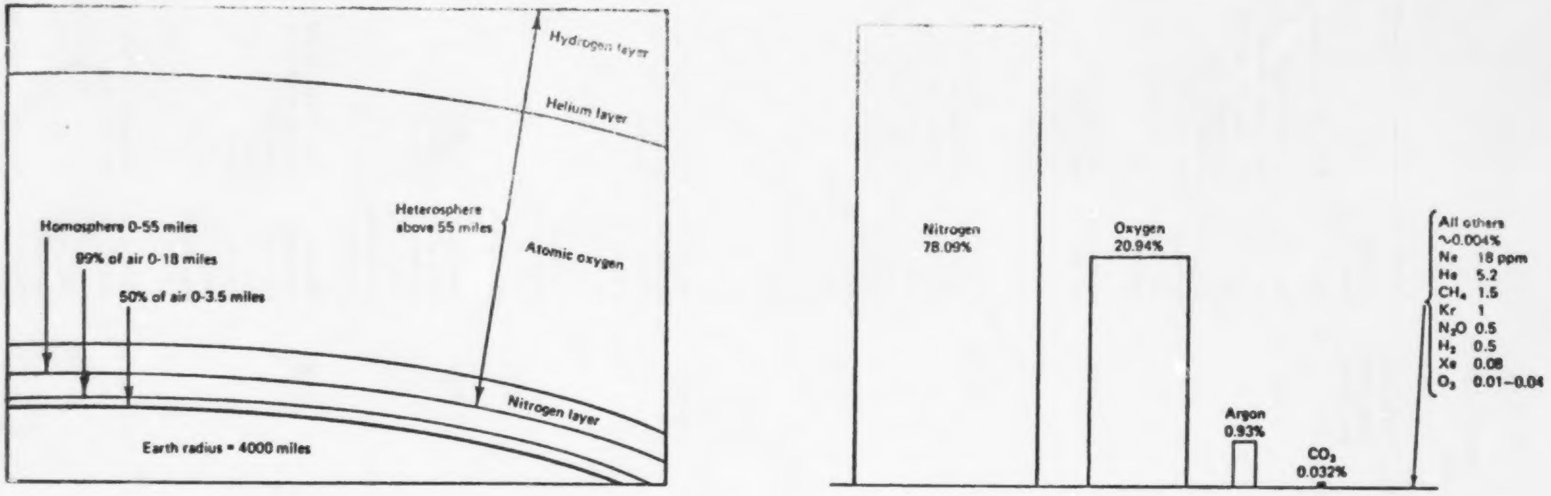
If, however, the air near ground level becomes colder (and thus denser) than the higher air masses, this vertical mixing ceases and a temperature inversion is formed -- air temperature increases with altitude. An inversion can form under a wide variety of circumstances. Radiation inversions often form during clear nights when the land surface cools faster than the air above it. Air at ground level thus cools

Table A

SUMMARY OF ANNUAL GLOBAL NATURAL AND MAN-CAUSED EMISSIONS OF MAJOR AIR POLLUTANTS

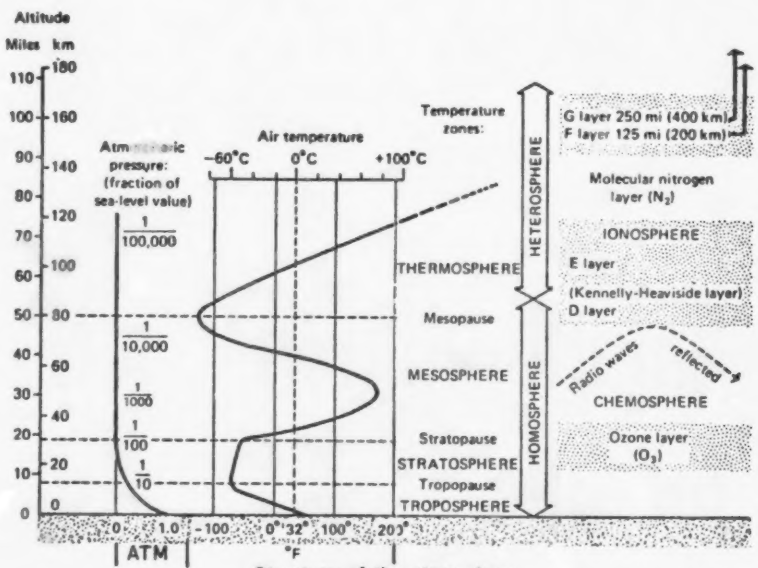
Contaminant	Major Pollution Sources	Natural Sources	Estimated Emissions (tons)		Atmospheric Background Concentrations	Calculated Atmospheric Residence Time	Removal Reactions and Sinks	Remarks
			Pollution	Natural				
SO_2	Combustion of coal and oil	Volcanoes	146×10^6	No estimate	0.2 ppb	4 days	Oxidation to sulfate by ozone or, after absorption, by solid and liquid aerosols	Photochemical oxidation with NO_2 and HC may be the process needed to give rapid transformation of $SO_2 \rightarrow SO_4$
H_2S	Chemical processes, sewage treatment	Volcanoes, biological action in swamp areas	3×10^6	100×10^6	0.2 ppb	2 days	Oxidation to SO_2	Only one set of background concentrations available
CO	Auto exhaust and other combustion	Photochemical oxidation of methane, forest fires, oceans, terpene reactions, volcanoes, decomposition of chlorophyll	304×10^4	3.47×10^9	0.1 ppm	1-4 months	Probably soil organisms and reaction with hydroxyl radical in stratosphere; possibly oxidation by NO_3	Ocean contributions to natural source probably low. Removal mechanisms poorly studied
NO/NO_2	Combustion	Bacterial action in soil (?)	53×10^6	NO: 430×10^6 NO_2: 658×10^6	NO: 0.2-2 ppb NO_2: 0.5-4 ppb	5 days	Oxidation to nitrate after sorption by solid and liquid aerosols, hydrocarbon photochemical reactions	Very little work done on natural process
NH_3	Waste treatment	Biological decay	4×10^6	1160×10^6	6 ppb to 20 ppb	7 days	Reaction with SO_2 to form $(NH_4)_2SO_4$ oxidation to nitrate	Formation of ammonium salts is major NH_3 sink
Hydrocarbons	Combustion exhaust, chemical processes	Biological processes	88×10^6	CH_4: 1.6×10^9 Terpenes: 200×10^6	CH_4: 1.5 ppm Non CH_4: <1 ppb	4 years (CH_4)	Photochemical reaction with NO/NO_2, O_3; large sink necessary for CH_4	"Reactive" hydrocarbon emissions from pollution equals 27×10^6 tons
CO_2	Combustion	Biological decay, release from oceans	1.4×10^{10}	10^{12}	325 ppm	2-4 years	Biological adsorption and photosynthesis, adsorption in oceans	Atmospheric concentrations increasing by 0.7 ppm/year

Source: Modified from E. R. Robinson and R. C. Robbins, 1972 (In: W. Strauss, ed., Part II), based on Urone, 1976 and Whelpdale and Munn, 1976.



Vertical distribution of air

Composition of dry air (% v/v).



Structure of the atmosphere

FIGURE A: STRUCTURE AND COMPOSITION OF THE ATMOSPHERE

Source: Modified from Urone, 1976.

more rapidly than air at higher altitudes, creating a temperature inversion. In mountainous areas, downslope movements of dense, cold air from higher elevations can create an inversion condition in valley areas. An influx of a shallow layer of cold air under a larger warm air mass will also create an inversion condition; this occurs frequently wherever cool sea breezes are common. A warm air mass moving into an area above a cold air mass at ground level can also create inversion conditions. A subsidence inversion forms when a large mass of air within a stagnant high pressure system sinks down over an area and is warmed by compression to a temperature higher than that of the surface air mass. This occurs because, as air from the center of a cell spreads outward, it is replaced by a sinking air mass from above.

Temperature inversions can form at ground level or at various altitudes above the land surface (Figure B). Both surface and elevated inversion layers may be present simultaneously. Surface inversions tend to break with normal daytime heating of the land while inversions aloft tend to be more persistent. The "magnitude" or strength of an inversion is indicated by the temperature difference between the base and the top of the inversion layer. The layer of air between ground level and the base of an inversion is called the "mixing layer".

Wind Patterns and Mixing of Pollutants

Wind patterns are of major concern in air pollution analysis because they govern the transport and dispersion of pollutants. Wind patterns near ground level are influenced significantly by topography. Ground level winds may also be significantly different (in regard to both velocity and direction) from winds at higher altitudes. The presence of inversion layers also influences, and is influenced by, wind patterns.

Several different patterns of long distance pollutant transport have been identified in California. The most frequent pattern involves transport by surface winds with the transported pollutants being mixed with pollutants generated in the downwind "receptor" areas.

Heating of interior valleys and mountain slopes can carry pollutants to higher altitudes. Under such conditions, pollutants often become concentrated in district layers (Figure C). If an elevated inversion layer is present, pollutants often concentrate just below the base of the inversion, or sometimes within the inversion layer. Breaks in inversion layers, especially over

Figure B

Typical Temperature/Altitude Profiles

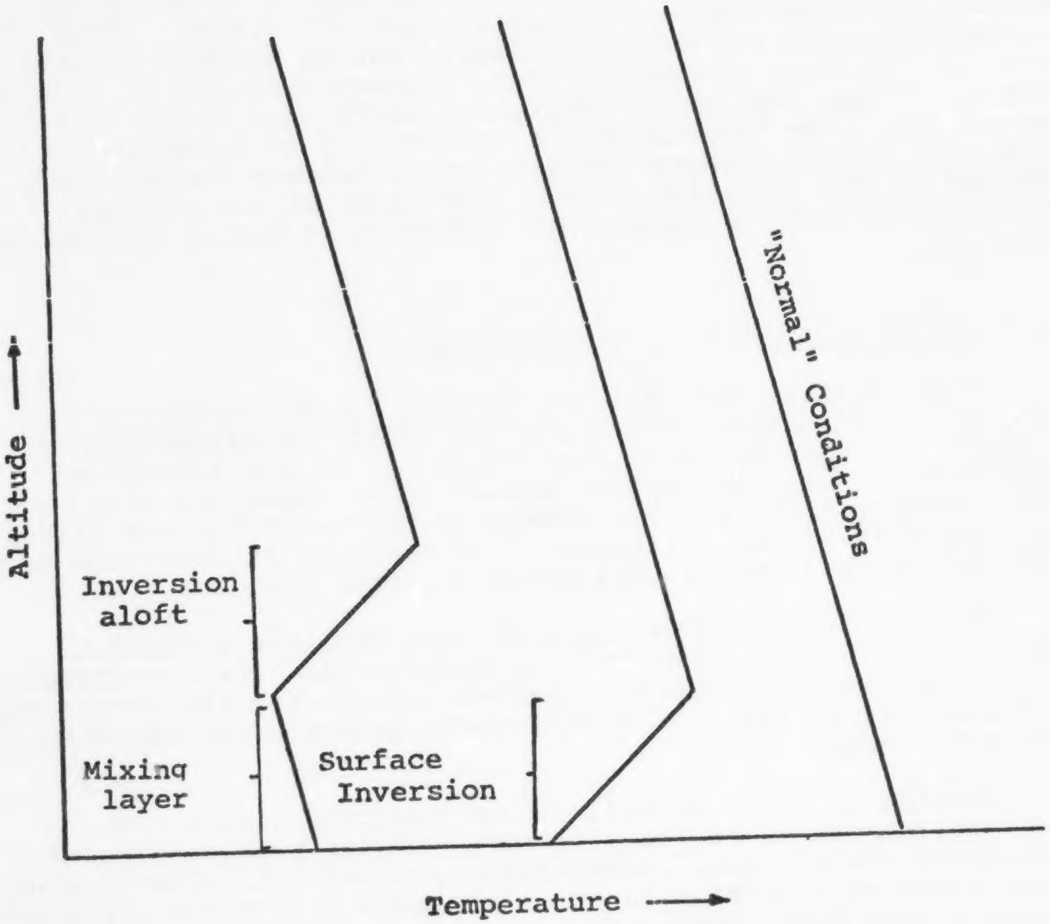
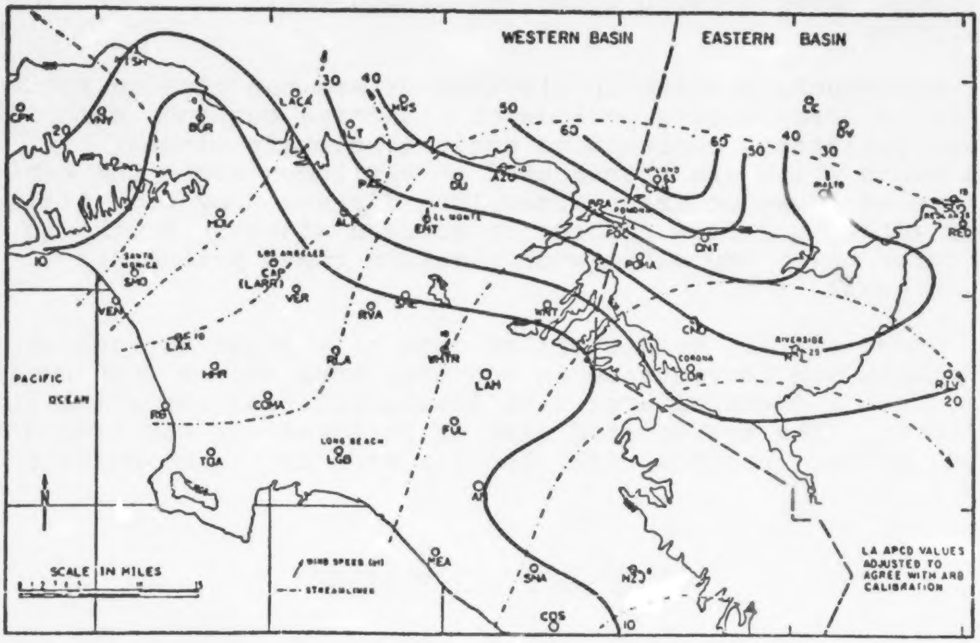
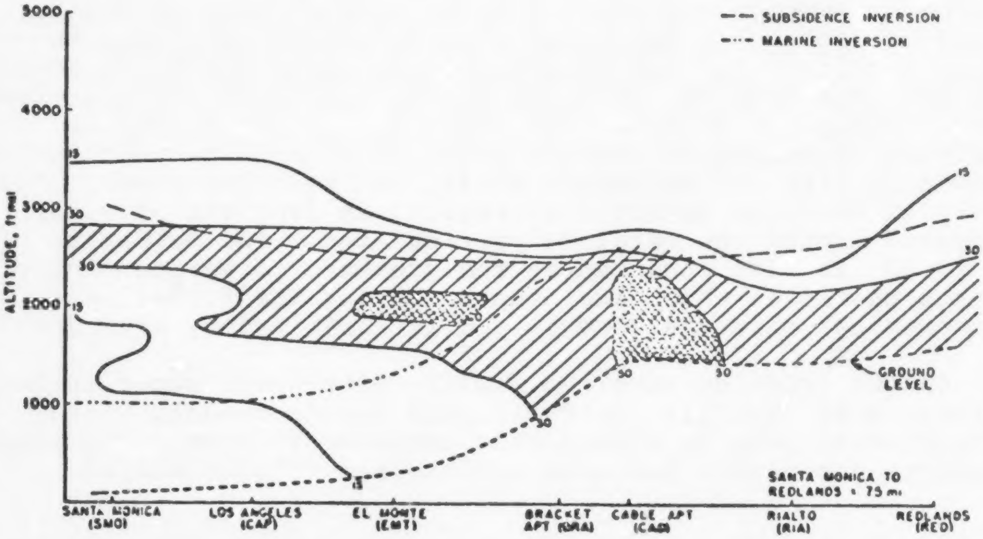


Figure C

OXIDANT DISTRIBUTION ON JULY 25, 1973



Surface ozone concentrations (pphm) 4:00-5:00 p.m. PDT and 4:00 p.m. PDT streamlines, July 25, 1973, in the South Coast Air Basin between sea level and the surrounding mountains.



Vertical cross section of ozone concentration (pphm) for late afternoon (4:30-6:30 p.m. PDT) July 25, 1973, in the South Coast Air Basin between sea level and the surrounding mountains.

Source: Blumenthal, 1976.

areas of elevated terrain, can allow pollutants to be carried to altitudes above the top of the inversion or to be returned to ground level through turbulent mixing where the inversion has broken.

Pollutants carried in elevated strata can also be returned to ground level during periods of nighttime cooling, especially if the pollutants concentrate against mountain slopes. Pollutants which are transported to altitudes above the top of an inversion may be transported long distances by high altitude winds (which may flow counter to surface winds). Breaks in the inversion layer may subsequently return these pollutants to ground level.

Under certain conditions of generally light surface winds, pollutants may concentrate in a source area and be transported in-mass to a downwind area with little dilution occurring during transport. The transported mass of polluted air may also displace, rather than mix with, the air mass in the downwind receptor area.

Air Pollution Chemistry

Sulfur Compounds

Most air pollutant emissions of sulfur compounds are in the form of sulfur dioxide (SO_2), with smaller amounts being emitted as hydrogen sulfide (H_2S) or sulfur trioxide (SO_3). In the atmosphere, hydrogen sulfide is readily oxidized to sulfur dioxide. In "clean" air, SO_2 oxidizes slowly to SO_3; this reaction proceeds more rapidly in the heated exhaust plume from a combustion source. The oxidation of SO_2 to SO_3 is catalyzed (accelerated) by the presence of metallic particulates, especially iron and manganese salts, and by water vapor. This catalyzed reaction occurs most readily in droplets of water condensed around the metallic particulates. The oxidation of SO_2 to SO_3 is also enhanced by the presence of various intermediate chemicals which are created during the formation of photochemical oxidants (smog), and is inhibited by nitrogen dioxide.

Sulfur trioxide combines rapidly with water vapor to form sulfuric acid (H_2SO_4). Sulfuric acid reacts readily with various metal ions or atmospheric ammonium to form particulate sulfates, especially ammonium sulfate and calcium sulfate.

Oxides of Nitrogen

Seven different oxides of nitrogen are known to exist, but only two, nitric oxide (NO) and nitrogen dioxide (NO_2) are significant air pollutants. Nearly all pollutant emissions of nitrogen oxides occur as nitric oxide. Nitric oxide is generated by high temperature combustion of organic nitrogen compounds or by thermal fixation of nitrogen gas (N_2), which comprises 78 percent of air. Nitric oxide molecules can spontaneously decompose into nitrogen gas and oxygen (O_2), but the rate of this reaction is extremely slow at normal air temperatures. Most frequently, nitric oxide is oxidized to nitrogen dioxide, either slowly by atmospheric oxygen or rapidly by natural concentrations of ozone (O_3).

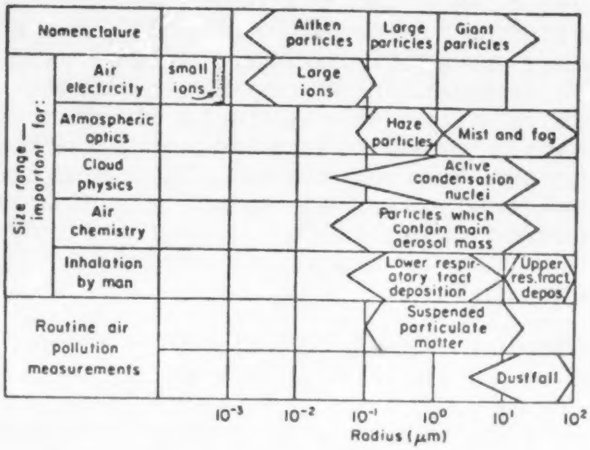
Nitrogen dioxide is rapidly oxidized by ozone, producing nitrogen trioxide (NO_3), which combines with NO_2 to form nitrogen pentoxide (N_2O_5). Nitrogen pentoxide combines readily with water vapor to form nitric acid (HNO_3). In fog droplets, nitrogen dioxide can be hydrated and catalytically oxidized directly to nitric acid. Nitric acid reacts readily with metal ions and atmospheric ammonium to form particulate nitrate salts. A reaction between nitrogen trioxide and carbon monoxide to produce nitrogen dioxide and carbon dioxide has recently been suggested by some researchers (Willix, 1976).

Several of the above compounds are photochemically active, undergoing various chemical reactions after absorbing energy from sunlight. Nitrogen dioxide in particular plays a major role in photochemical reactions (discussed below).

Aerosols

The term aerosols is applied to the whole range of solid or liquid particles that occur in the atmosphere. Some aerosols are living organisms or are derived from living organisms (i.e., pollen grains, viruses, bacteria, algae, protozoa, molds, fungi, yeasts, spores, etc.); these are often referred to as "viable particulates". Non-viable particulates are often classified as dispersion aerosols (formed by grinding or atomization of solids and liquids) or as condensation aerosols (formed when supersaturated or saturated vapors condense, or by chemical reactions among gases to form a volatile or non-volatile solid product). Aerosol sizes are often measured in units of microns (μm). One micron equals 1/1,000 millimeter, or slightly less than 4/100,000 inches (3.94×10^{-5} inches). Figure D illustrates additional aspects of terminology and the importance of aerosols in different size ranges.

Figure D. Terminology and Importance of Natural Aerosols.



Source: Corn, 1976.

The importance of aerosols in terms of atmospheric chemistry depends largely on the size and shape, surface electrical charge, and chemical composition of aerosol particles. Particle shapes are often classified as spherical, cubical, irregular, flakes, fibrous, or condensation flocks. Aerosols participate in chemical reactions in three different ways: by providing either a dry substrate or an aqueous environment in which other chemicals react; by participating in reactions as a catalyst; and by direct involvement as a primary reactant.

Photochemical Reactions

Photochemical reactions are those in which the energy content of sunlight (and ultraviolet radiation in particular) is absorbed by a compound and provides the activation energy necessary to initiate a variety of chemical reactions. The energy content of light depends upon its wavelength; the shorter the wavelength the higher the energy content. The stratospheric ozone layer generally prevents wavelengths below 2,900 angstroms (1 angstrom equals 10^{-10} meters, or 10^{-4} microns) from reaching the earth's surface.

If exposed to light of a short enough wavelength, a large number of chemicals will be decomposed. Compounds known to undergo photochemical decomposition in the lower atmosphere include nitrogen dioxide (NO_2), nitrous acid (HNO_2), nitric acid (HNO_3), hydrogen peroxide (H_2O_2), and various organic peroxides, aldehydes, ketones, and organic nitrates. Such photochemical decomposition usually leaves one or more of the decomposition products in a highly energized or reactive state.

Nitrogen oxides become involved in photochemical reactions in several ways. Nitric oxide reacts with ozone to produce molecular oxygen and nitrogen dioxide. This reduces oxidant levels, especially in the immediate vicinity of freeways, power plants, and other major high-temperature combustion sources. The nitrogen dioxide thus formed, however, participates in a complex series of chemical reactions leading to the formation of numerous photochemical oxidants, including ozone.

The photochemical oxidation process normally begins with the photochemical decomposition of nitrogen dioxide into nitric oxide and a free oxygen atom (O). Following this initial step, numerous organic gases, water vapor, nitrogen oxides, oxygen and ozone take part in a lengthy series of interdependent chemical reactions. During the course of these reactions, some of the nitrogen dioxide which initiated the process is converted to various complex organic nitrates. Most NO_2, however, serves only as an intermediate reactant and is eventually regenerated as nitrogen dioxide. This regenerated nitrogen dioxide is then available to initiate another sequence of photochemical reactions. Table B summarizes the current state of knowledge about some of the more important reactions which are believed to occur in the photochemical oxidation process.

The major products of the photochemical oxidation process are ozone, aldehydes (especially formaldehyde and acrolein), ketones, peroxyacyl nitrates (especially peroxyacetyl nitrate or PAN), organic nitrates, organic peroxides, hydrogen peroxides, carbon dioxide, and carbon monoxide. Ozone is normally the major product, but is so chemically reactive that high levels can be maintained in polluted air only while it is being continuously generated by the photochemical oxidation process. Thus, ozone levels rapidly decline at night or during cloudy weather. High ozone levels may persist throughout the night or for a few days if a mass of smog is transported into an area having few local pollution sources. This situation is due to the absence of other chemicals with which ozone can react.

Table B

REACTION RATES FOR IMPORTANT STEPS IN THE PHOTOCHEMICAL OXIDATION PROCESS

Reaction	*Comments*
1. $NO_2 + h\nu \rightarrow NO + O$	$k_a Ø$ uncertain by ~20%; difficulties encountered in trying to relate measured k_d to $k_a Ø$
2. $O + O_2 + M \rightarrow O_3 + M$	Well known; $k = 2.0 \times 10^{-5}$ ppm^{-2} min^{-1}
3. $O_3 + NO \rightarrow O_2 + NO_2$	$20 \leq k \leq 40$ ppm^{-1} min^{-1}
4. $O_3 + NO_2 \rightarrow NO_3 + O_2$	Two measured values, 0.11 and 0.048 ppm^{-1} min^{-1}, both of which may be too high
5. $NO_2 + NO_3 \rightarrow N_2O_5$	k_5 and k_6 uncertain by ~20%; equilibrium constant is very temperature dependent
6. $N_2O_5 \rightarrow NO_2 + NO_3$	
7. $N_2O_5 + H_2O \rightarrow 2HNO_3$	Reaction in gas phase is negligible; reaction occurs only on surfaces
8. $NO_3 + NO \rightarrow 2NO_2$	k factor of 10^3 uncertainty; most important NO_3 removal process
9. $NO_3 + h\nu \rightarrow NO_2 + O$	Importance not determined
10. $NO + NO_2 + H_2O \rightarrow 2HONO$	Rate may be higher than first order with respect to H_2O; heterogeneous contributions to this rate not determined
11. $2HONO \rightarrow NO + NO_2 + H_2O$	
12. $HONO + h\nu \rightarrow OH + NO$	$k_{12} \sim 0.1\, k_a Ø$; photolysis of HONO in early morning may initiate smog formation
13. $OH + NO_2 + [M] \rightarrow HNO_3 + [M]$	k uncertain; order of reaction depends on pressure of M; probably second order in atmosphere
14. $OH + NO + [M] \rightarrow HONO + [M]$	k uncertain; pressure dependence not determined
15. $OH + CO \rightarrow CO_2 + H$	$230 \leq k \leq 280$ ppm^{-1} min^{-1}; reaction is too slow to compete with olefin–OH reactions
16. $H + O_2 + M \rightarrow HO_2 + M$	Only atmospheric reaction of importance for H atoms
17. $HO_2 + NO \rightarrow HO + NO_2$	$10^2 \leq k \leq 10^3$ ppm^{-1} min^{-1}; most important HO_2 removal process
18. $2HO_2 \rightarrow H_2O_2 + O_2$	k uncertain by ~50%
19. $H_2O_2 + h\nu \rightarrow 2OH$	Photolysis rate in sunlight not well known
20. Paraffins $+ O \rightarrow R + OH$	k uncertain by ~ factor of 10
21. Paraffins $+ OH \rightarrow R + H_2O$	k uncertain by ~ factor of 10
22. Olefins $+ O \rightarrow$?	k factor of 2 uncertainty; products of reaction under atmospheric conditions unknown
23. Olefins $+ OH \rightarrow$?	Most important olefin reaction; products of reaction unknown
24. Olefins $+ O_3 \rightarrow$ aldehyde + zwitterion	k factor of 2 uncertainty; reactions of zwitterion unknown
25. Olefins $+ H_2O \rightarrow$?	Probably unimportant
26. Aromatics $+ O \rightarrow R + OH$	k's for most reactions unknown; $k_{26} \sim k_{20}$
27. Aromatics $+ OH \rightarrow R + H_2O$	k's for most reactions unknown
28. $RCHO + h\nu \rightarrow R + HCO$	Quantum yields as function of $h\nu$ not well known; k_{28} may be an important chain initiation step in atmosphere
29. $RCHO + h\nu \rightarrow RH + CO$	
30. $RCHO + OH \rightarrow RCO + H_2O$	$k \sim 10^4$ ppm^{-1} min^{-1}
31. $RCHO + O \rightarrow RCO + OH$	Slow compared to R. 30
32. $HCO + O_2 \rightarrow HO_2 + CO$	k high; only important HCO reaction
33. $RCO + O_2 \rightarrow RC(O)OO$	Only RCO reaction of importance
34. $RC(O)OO + NO \rightarrow R + CO_2 + NO_2$	k unknown
35. $RC(O)OO + NO_2 \rightarrow RC(O)OONO_2$	k unknown
36. $R + O_2 \rightarrow RO_2$	Very fast
37. $RO_2 + NO \rightarrow RO + NO_2$	k unknown
38. $RO_2 + NO_2 \rightarrow RO_2NO_2$	k unknown
39. $RO_2 + HO_2 \rightarrow ROOH + O_2$	k unknown
40. $RO + O_2 \rightarrow RCHO + HO_2$	k unknown
41. $RO + NO \rightarrow RONO$	k unknown
42. $RO + NO_2 \rightarrow RONO_2$	k unknown

NOTES:
$h\nu$ light energy
M energy absorbing molecule or catalyst
R hydrogen atom or hydrocarbon group

Source: Hecht, 1973, as presented in Haagen-Smit and Wayne, 1976.

Under certain conditions the initial photochemical reaction during which nitrogen dioxide is decomposed can be replaced by the photochemical decomposition of various organic compounds, halogens or metal oxides (Haagen-Smit and Wayne, 1976). Haagen-Smitt and Wayne (1976) cite Adams and Schneider (1952) as documenting an instance where the combined emissions of styrene ($C_6H_5CHCH_2$) and halogens produced eye irritants through a photochemically catalyzed process.

Paskind and Kinosian (1974) present evidence that oxidant levels depend on not only the absolute amounts, but also the ratio between hydrocarbon and nitrogen oxide levels. Oxidant levels will increase or decrease with corresponding changes in hydrocarbon levels. A change in nitrogen oxide levels (either increase or decrease) may, depending on the relative quantities of hydrocarbons present, produce either an increase or a decrease in oxidant values. This situation is due to the various roles which nitrogen oxides can play during the photochemical reaction process and to the chemical reactivity of ozone. Both Paskind and Kinosian (1974) and Pitts, et.al. (1975) present data suggesting that a reduction of nitrogen oxide levels in such heavily urbanized areas as central Los Angeles and northern Orange Counties will probably enhance rather than reduce the formation of photochemical oxidants (Figure E).

Five major groups of organic gases are normally involved as primary reactants in the photochemical oxidation process: alkanes (paraffins), alkenes (olefins), acetylenes, aromatic hydrocarbons and aldehydes. Several attempts have been made to classify organic gases according to their tendency to participate in photochemical reactions. While differing in details and in the number of reactivity classes used, most studies indicate the following type of classification.

High Reactivity. Internally double-bonded olefins, especially tri- and tetraalkyl ethylenes.

Moderate Reactivity. Polyalkyl benzenes, monoalkyl ethylenes, 1,3-alkadienes.

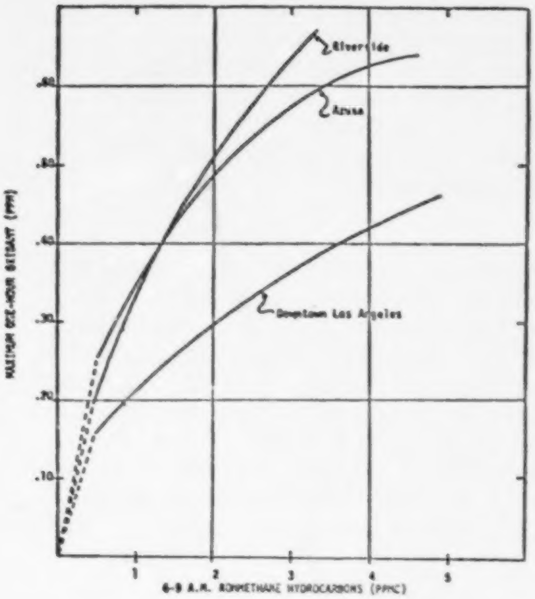
Low Reactivity. Ethylene, monoalkyl benzenes, alkanes (C_4 and higher).

Negligible Reactivity. Benzene, acetylene, methane, ethane, propane.

Table C presents the reactivity classification currently used by the California Air Resources Board. It should be noted that chemical reactivity is not always correlated with the extent to which a compound or its reaction products cause physiological effects on people, plants or animals.

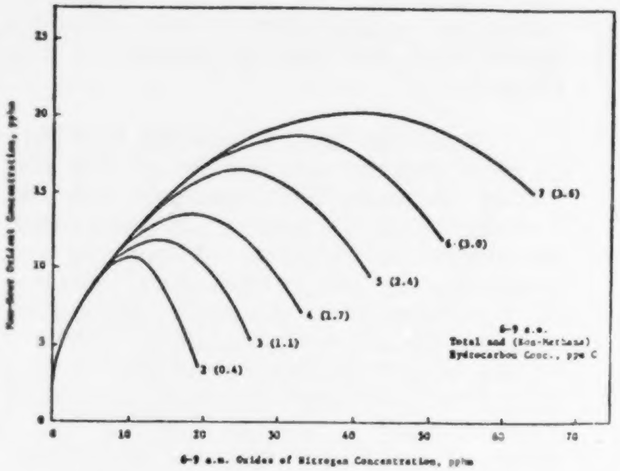
Figure E

NONLINEAR RELATIONSHIPS AMONG HYDROCARBON, NITROGEN OXIDES AND OXIDANT VALUES

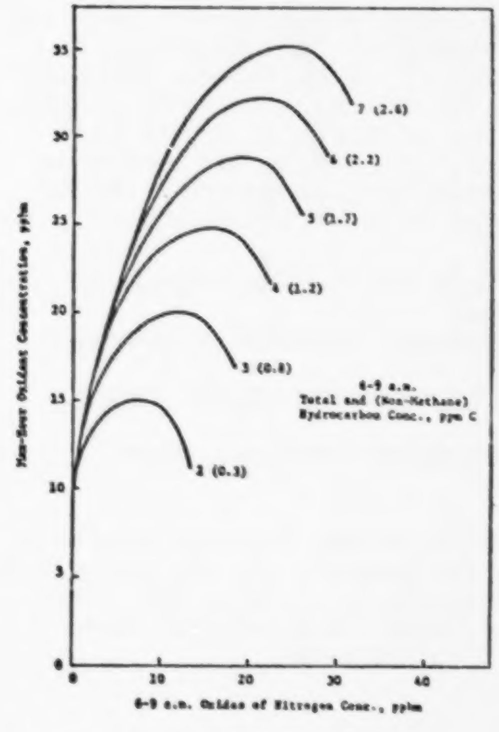


Basis for Schuck/Papetti Oxidant Model

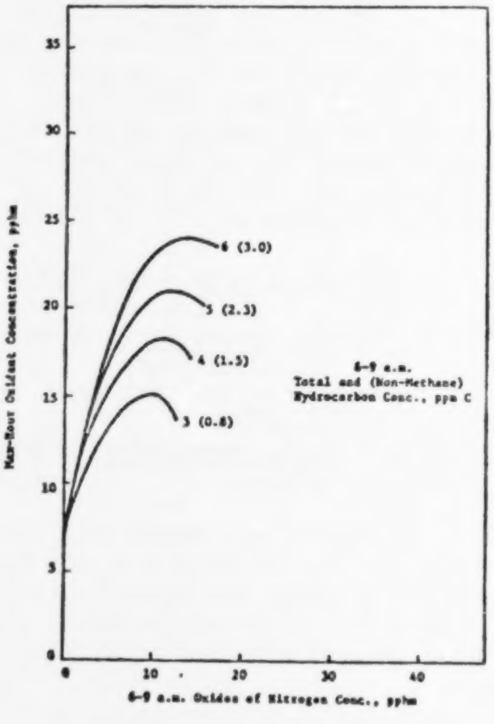
Upper Limit Curves for Three Stations in the Metropolitan Los Angeles AQCR (1)



Pollutant relationships at Los Angeles. Data period: July-Sept. 1969-1972. (2)



Pollutant relationships at Azusa. Data period: July-Sept. 1969-1972. (2)



Pollutant relationships at San Bernardino. Data period: July-Sept. 1969-1972. (2)

Sources: (1) Boundaries and Forecasting Committee, 1976.
(2) Paskind and Kinosian, 1974.

Table C

AIR RESOURCES BOARD
REACTIVITY CLASSIFICATION OF ORGANIC COMPOUNDS

Class I (Low Reactivity)	Class II (Moderate Reactivity)	Class III (High Reactivity)
C_1-C_2 Paraffins	Mono-tert-alkyl-benzenes	All other aromatic hydrocarbons
Acetylene	Cyclic Ketones	All Olefinic hydrocarbons (including partially halogenated)
Benzene	Alkyl acetates	Aliphatic aldehydes
Benzaldehyde	2-Nitropropane	Branched alkyl Ketones
Acetone	C_3+ Paraffins	Cellosolve acetate
Methanol	Cycloparaffins	Unsaturated Ketones
Tert-alkyl alcohols	n-alkyl Ketones	Primary & secondary C_2+ alcohols
Phenyl acetate	N-methyl pyrrolidone	Diacetone alcohol
Methyl benzoate	N,N-dimethyl acetamide	Ethers
Ethyl Amines	Alkyl Phenols*	Cellosolves
Dimethyl formamide	Methyl phthalates**	Glycols*
Perhalogenated Hydrocarbons		C_2+ Alkyl phthalates**
Partially halogenated paraffins		Other Esters**
Phthalic Anhydride**		Alcohol Amines**
Phthalic Acids**		C_3+ Organic acids + di acid**
Acetonitrile*		C_3+ di acid anhydrides**
Acetic Acid		Formin** (Hexa methylene-tetramine)
Aromatic Amines		Terpenic hydrocarbon
Hydroxyl Amines		Olefin oxides**
Naphthalene*		
Chlorobenzenes*		
Nitrobenzenes*		
Phenol*		

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*Reactivity data are either non-existent or inconclusive, but conclusive data from similar compounds are available; therefore, rating is uncertain but reasonable.

**Reactivity data are uncertain.

Source: California Air Resources Board, 1976e.

Pollutant Removal Mechanisms

Pollutants which are added to or formed in the atmosphere are removed through six general mechanisms: gravitational settling; impaction on surfaces; precipitation processes; diffusion into bodies of water; chemical reactions; and biological uptake or metabolism. Primary and secondary aerosols are removed from the atmosphere primarily by the first three processes, while gaseous pollutants are removed primarily by the last four processes.

Removal of Aerosols

The rate at which aerosols settle out of the air depends on the size, weight and shape of the particle, as well as on such meteorological factors as wind speed, vertical temperature gradients and atmospheric turbulence. Spherical particles settle more rapidly than non-spherical particles. In calm air, particles smaller than a few microns in diameter show little or no tendency to settle, being kept in suspension by the random motion of air molecules and similar forces. Small particles will often adhere to each other when they come in contact. Such coagulation of small particles can produce aerosols large enough to settle out of the atmosphere. Aerosols will also adhere to the surface of objects at the earth's surface when blown against them. Removal by impaction occurs most effectively with larger particles and on wet surfaces.

Aerosols larger than about 0.1 micron in diameter are, depending on chemical composition, capable of serving as condensation nuclei in the process of mist, fog or cloud formation. Water-insoluble particles within this size range may also become involved as condensation nuclei following agglomeration with smaller hygroscopic particles or adsorption of water-soluble gases or vapors. Water droplets, ice crystals or snow flakes formed by such processes can be increased in size by continued condensation or by collision and agglomeration of droplets to the point where the resulting drops or flakes fall to earth. "Rainout" of particulates which serve as condensation nuclei represents a major mechanism for removal of aerosols. "Washout" of aerosols occurs when a falling raindrop or snowflake accumulates other particles as it falls. Such washout mechanisms are ineffective in removing particles smaller than 2 microns in diameter, and are most effective in removing particles which have become wetted by condensation of water vapor or other gases.

Removal of Gaseous Pollutants

Table D identifies pollutant removal mechanisms (sinks) which affect various gaseous air pollutants.

As discussed previously, gaseous pollutants such as sulfur and nitrogen oxides undergo chemical reactions which produce liquid or solid aerosols. These aerosols can serve as condensation nuclei, resulting in rainout or washout of the pollutants. In addition, many gaseous pollutants are at least slightly soluble in water. These pollutants can diffuse into water droplets formed around condensation nuclei, and thus experience washout in this fashion. Because diffusion occurs in proportion to concentration differences, it is possible for pollutants to diffuse into water droplets in one area, be transported by winds to a different area, and diffuse out of the droplets at the second area. Diffusion can also occur into or out of water bodies such as rivers, lakes and oceans.

Chemical reactions involving gaseous pollutants have been discussed previously. These reactions can transform pollutants into normal constituents of the atmosphere, secondary gaseous pollutants, or secondary aerosol pollutants. In addition to chemical reactions in the atmosphere, reactions can occur as pollutants come in contact with objects at the earth's surface.

A final mechanism for removal of gaseous pollutants involves biological processes. Most living organisms, but especially microorganisms and higher plants, absorb many atmospheric gases. Pollutants in these gases may be stored in living tissue, biochemically decomposed to other substances by normal metabolic processes, or may react chemically or biochemically with living tissues. The results of these reactions and metabolic processes may be either detrimental, beneficial or innocuous to the organisms involved.

It is often assumed that removal processes such as those described above are, over any period of a few years, able to prevent any permanent increase in average global concentrations of most pollutants. For most pollutants, however, monitoring instruments are both insufficiently sensitive and inadequately located to provide reliable evidence regarding long-term, global trends in pollutant concentrations. There is, on the other hand, reliable evidence of a global, long-term trend of increasing carbon dioxide (CO_2) levels, most likely related to increasing combustion of fossil fuels (see Table A). Carbon dioxide, however, is seldom viewed as an air pollutant on a local or regional level. There is also significant evidence that suspended particulate levels are increasing, at least over much of the northern hemisphere. Much of this increase appears to be due to photochemically generated aerosols (Whelpdale and Munn, 1976).

Table D

REMOVAL MECHANISMS FOR GASEOUS POLLUTANTS

Substance	*Sinks*
Sulfur dioxide	Precipitation scavenging: washout, rainout Oxidation in gas and liquid phase to sulfate Soil: microbial degradation, physical and chemical reaction, absorption Vegetation: sorption on surfaces, stomatal intake Oceans, lakes: absorption
Hydrogen sulfide	Oxidation to sulfur dioxide
Ozone	Chemical reaction on vegetation, soil, snow and ocean surfaces
Nitrous oxide	Soil: microbiological destruction Stratosphere: photodissociation Ocean: absorption
Nitric oxide/ nitrogen dioxide	Soil: chemical reaction Vegetation: sorption, stomatal uptake Chemical reaction in gas and liquid phase
Ammonia	Chemical reaction to ammonium in gas and liquid phase Precipitation scavenging: washout, rainout Surface uptake: physical and chemical reaction, absorption
Carbon monoxide	Stratosphere: reaction with hydroxyl radical Soil: microbiological activity
Carbon dioxide	Vegetation: photosynthesis, absorption Oceans: absorption
Methane	Soil: microbiological activity Vegetation: chemical reaction, bacterial action Troposphere and stratosphere: chemical reaction
Hydrocarbons	Chemical reaction to particulates Soil: microbiological activity Vegetation: Absorption, stomatal intake

Source: Whelpdale and Munn, 1976.

Effects of Air Pollutants

The effects of air pollutants can generally be categorized as visibility reduction and light scattering; meteorological effects; damage to materials and structures; physiological effects on living organisms; and psychological effects on people.

Visibility Reduction

Visibility reduction by air pollutants is caused primarily by aerosols, although colored gases or water vapor may be significant in special cases. Reduced visibility can be due to dense accumulations of particulates blocking light transmittance by obstruction, or to scattering of light by lower concentrations of aerosols. Significant visibility reduction due to light scattering is often associated with the condensation of water vapor or other liquids around particulates in the 0.1 to 1.0 micron size range. Visibility reduction per se has two major types of consequences -- transportation-related hazards and aesthetic impacts.

Meteorological Effects

Meteorological effects of air pollutants are experienced on both an areawide or local scale and on a global or continental scale. Local or areawide meteorological effects are due mostly to the emissions of aerosols, heat and water vapor. While heat emissions in themselves are seldom viewed as air pollution, heat added to the atmosphere, especially in urban areas, can affect certain meteorological conditions. Urban areas are enveloped by a mass of air that is generally warmer than the air masses over adjacent rural areas. This temperature difference is most pronounced at night, when maximum temperature differences of 3-10°C (6-21°F) can occur. Mean annual temperature differences between adjacent urban and rural areas are usually 0.5-1.5°C (1-3°F). These temperature differences can have significant effects on the local transport and dilution of air pollutants.

The major meteorological effect of local air pollution involves influences on precipitation phenomena. An increase in local aerosol levels (either primary or secondary aerosols) can significantly increase the frequency of fog occurrences, and will in some cases increase cloud cover and/or precipitation rates. The increased occurrence of haze and fog can also affect local thermal and light intensity regimes. If ambient aerosol levels are often high, significant emissions of water vapor can also lead to increased fog or haze formation. Table E summarizes the meteorological effects of urbanization and its attendant pollutant emissions.

Table E

AVERAGE CHANGES IN CLIMATIC ELEMENTS CAUSED BY URBANIZATION

Element	Comparison with Rural Environment
Contaminants:	
condensation nuclei and particles	10 times more
gaseous admixtures	5 to 25 times more
Cloudiness:	
cover	5 to 10 percent more
fog—winter	100 percent more
fog—summer	30 percent more
Precipitation:	
totals	5 to 10 percent more
days with less than 5 mm	10 percent more
snowfall	5 percent more
Relative humidity:	
winter	2 percent less
summer	8 percent less
Radiation:	
global	15 to 20 percent less
ultraviolet—winter	30 percent less
ultraviolet—summer	5 percent less
sunshine duration	5 to 15 percent less
Temperature:	
annual mean	0.5° to 1.0° C more
winter minima (average)	1° to 2° C more
heating degree days	10 percent less
Wind speed:	
annual mean	20 to 30 percent less
extreme gusts	10 to 20 percent less
calms	5 to 20 percent more

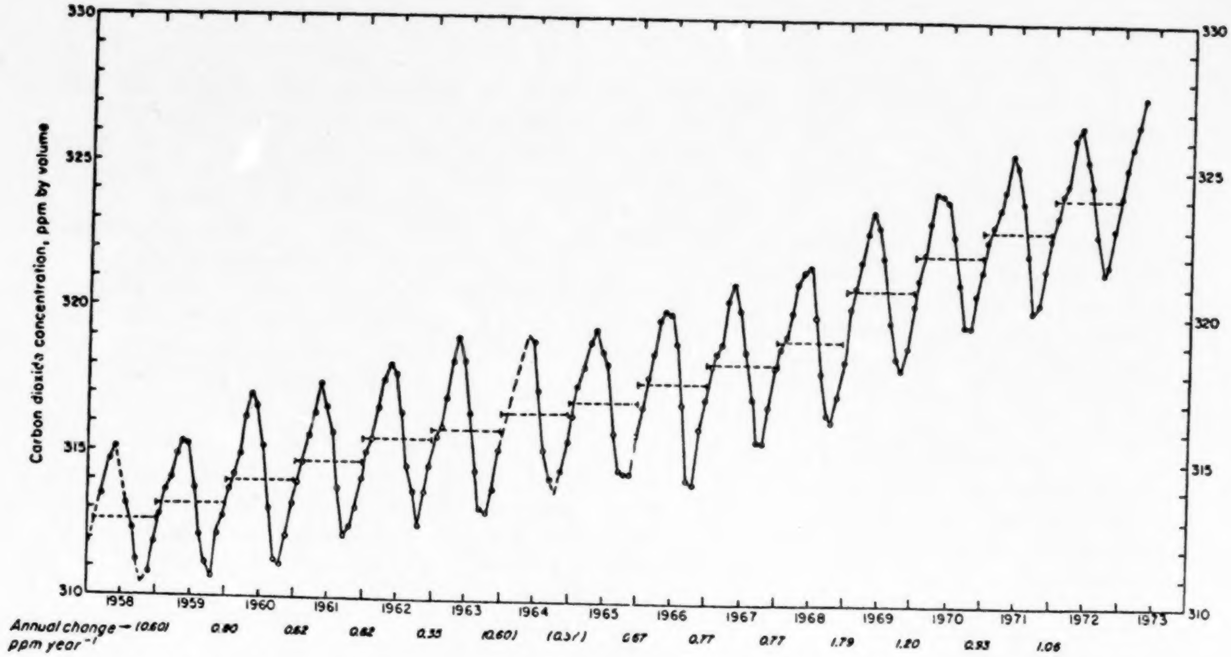
Source: Landsberg, 1970.

On a global and continental scale, three major types of air pollution effects on climate are evident. Global increases in carbon dioxide levels (Figure F) are influencing global temperature regimes. Most of the energy content of sunlight reaching the earth's surface is in the shorter wavelengths of light (toward the ultraviolet portion of the spectrum). Heat produced by absorption of sunlight is radiated as longer wavelengths (toward the infrared portion of the spectrum). Carbon dioxide and water vapor are strong absorbers of infrared radiation; thus, an increase in CO_2 levels in the lower atmosphere traps heat radiated from the earth's surface (the "greenhouse effect").

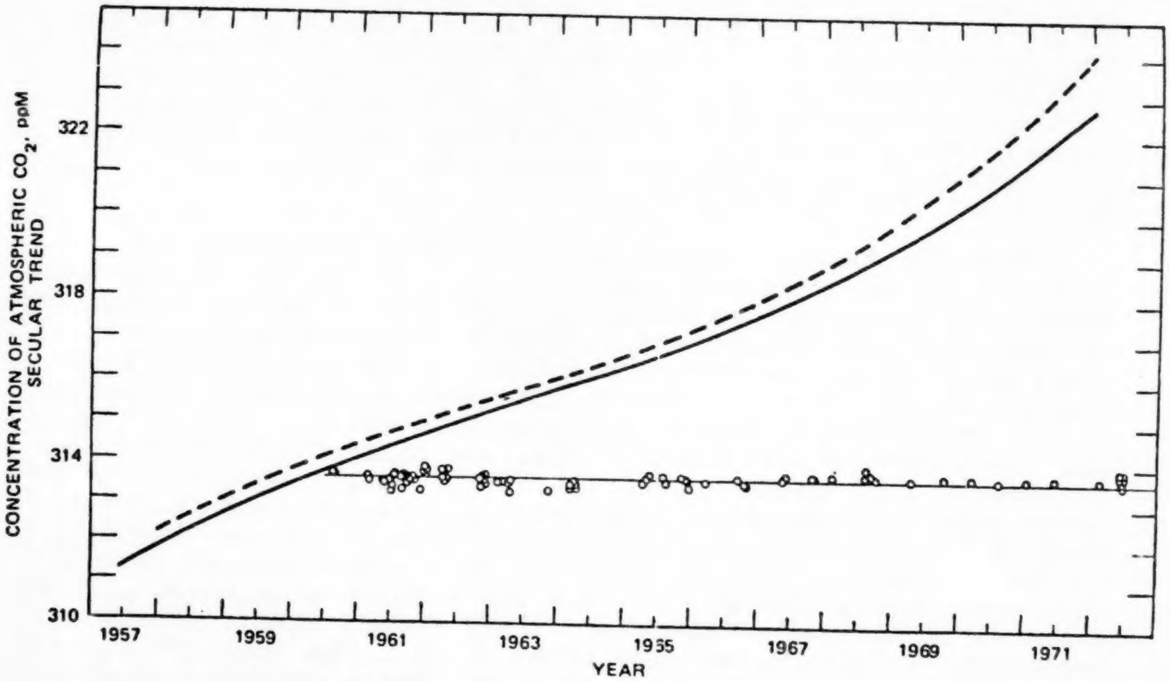
The apparent increase in aerosol concentrations is probably affecting global climatic factors in two major ways. Particulates directly reflect incoming solar radiation back toward space, thus reducing the amount of sunlight reaching the earth's surface. Increases in cloud cover due to condensation of water vapor around aerosols also result in increased reflectance of solar radiation. High altitude cirrus clouds may be especially important in this regard.

Pollutant effects on the stratospheric ozone layer (Figure A) have received significant attention in recent years. This ozone layer shields the earth's surface from high energy, shortwave radiation. Direct injection of combustion products from aircraft flying through the stratosphere could produce reductions in the ozone layer. Both water vapor and oxides of nitrogen would convert stratospheric ozone to molecular oxygen. There is significant uncertainty regarding the potential magnitude of current and future stratospheric ozone reductions from this source.

Most pollutants emitted into the lower atmosphere are unlikely to reach the stratospheric ozone layer due to chemical reactions, precipitation phenomena, and other removal mechanisms operating in the troposphere. Certain compounds which are chemically unreactive under conditions prevailing in the lower atmosphere may, when exposed to intensive ultraviolet radiation in the stratosphere, become involved in chemical reactions in the stratospheric ozone layer. Various chlorofluorcarbons (Freons) are of special concern in this regard, because of the large quantities produced industrially (850,000 tons in 1973), their use as aerosol propellants resulting in direct discharge to the atmosphere, and the lack of significant natural removal from the lower atmosphere (Freons are insoluble in water). Upon exposure to intense ultraviolet light, Freons ($CFCl_3$ and CF_2Cl_2) decompose, releasing chlorine atoms (Cl^-). The chlorine atoms take part in several chemical reactions which convert ozone to molecular oxygen.



Mean monthly carbon dioxide concentrations at Mauna Loa. Horizontal dashed lines indicate average yearly value. Annual changes in parenthesis are based on incomplete record



Comparisons of secular trends of atmospheric CO_2 concentration at Mauna Loa and the South Pole. The dashed curve is for Mauna Loa; the full curve for the South Pole. ○: analyses of a Scripps Institution surveillance reference gas whose mean value is plotted as a straight line.

FIGURE F. GLOBAL CARBON DIOXIDE LEVELS

SOURCES: WHELPDALE & MUNN, 1976
EKDAHL & KEELING, 1973

Reductions in the stratospheric ozone layer will result in increased levels of ultraviolet radiation reaching the earth's surface. Because of its high energy content, ultraviolet light can be physiologically damaging to living tissues and has the potential for causing an increase in genetic mutation rates. Increased ultraviolet radiation might also affect weather patterns through increased heating of the earth's surface and lower atmosphere. Increased ultraviolet radiation could also affect the rates of various chemical reactions, either in the atmosphere, in water, or on surfaces or structures. The potential magnitude of such effects due to any given reduction in the stratospheric ozone layer is at present uncertain.

Damage to Materials and Structures

Air pollutants affect materials and structures either through physical soiling (deposition of particulates) or through chemical reactions (which depend on the chemical composition of both the air pollutant and the material affected). Aerosols are involved in chemical reactions both as primary reactants and as catalysts which speed reactions between other pollutants and materials or structures.

Sulfur oxides, nitrogen oxides, hydrogen fluoride, hydrogen chloride, and numerous other air pollutants combine with water vapor to form strong acids which can corrode, dissolve, or otherwise damage a wide variety of materials. In addition to man-made materials and structures, soils, rock surfaces and bodies of water can be affected by acidic aerosols or by acid precipitation. The potential for acid precipitation depends not only on the presence of acid precursors during the normal precipitation seasons, but also on the extent and rate at which other atmospheric constituents can neutralize the acids through the formation of particulate salts (Winkler, 1976).

Pollutants which are strong oxidizing agents (NO_2 and ozone in particular) can cause a number of chemical reactions which damage materials. Pigments, dyes, synthetic textiles and rubber are among the prominent materials affected.

Physiological Effects

Physiological effects of various air pollutants on human health, vegetation and laboratory animals have been well studied, even though many issues remain unresolved. Most studies have involved exposure to single pollutants, rather than to the types of pollutant mixtures which occur in the atmosphere. The effect of simultaneous exposure to two or more compounds may be qualitatively or quantitatively different from the effects of either compound experienced alone. In addition, the presence of one compound may increase the magnitude of an effect produced by a given amount of a second compound (synergistic effect). Antagonistic effects occur when the presence of one compound inhibits or reduces the effect of a second compound. When two compounds produce similar effects, exposure to a mixture of the two may produce a synergistic, antagonistic, or an additive effect.

Human Health. A variety of different health effects of air pollutants have been recognized. The most frequently observed effect involves irritation of the respiratory system. Long-term exposure to respiratory irritants can greatly increase the chances of chronic respiratory diseases such as chronic bronchitis, pulmonary emphysema and lung cancer. Short-term exposure to high pollutant dosages can cause acute respiratory problems or even death. Pollutants usually identified as contributors to respiratory problems include ozone, nitrogen dioxide, oxides of sulfur, sulfuric acid mists, and aerosols. The combination of particulates and sulfur oxides (probably sulfates and sulfuric acid) is suspected of being the cause of several severe pollution episodes in which deaths were clearly attributable to air pollution. The 1930 air pollution episode in the Meuse Valley of Belgium resulted in 60 deaths and thousands of illnesses. The 1948 Donora, Pennsylvania episode caused 20 deaths and nearly 6,000 illnesses in a town of 14,000. The 1952 London episode produced about 4,000 deaths. A 1962 London episode produced 750 deaths. Air pollution episodes in New York City are considered responsible for causing about 400 deaths in 1963 and 168 in 1966 (American Lung Association, 1974).

Eye irritation is a second widespread effect of air pollution. Ozone, nitrogen dioxide, PAN, and other oxidants are primarily responsible. When absorbed into the blood stream, carbon monoxide, ozone and nitrogen oxides can reduce the oxygen-carrying ability of hemoglobin; carbon monoxide is usually responsible for serious effects in this regard. Respiratory allergies such as asthma can be triggered by a variety of aerosols, sulfur dioxide or ozone. Asthma-producing aerosol pollutants may be either nonviable aerosols (primarily dusts and organic particulates) or viable aerosols (pollen, molds, etc.). It should be noted that viable particulates may be attributable to human actions (agriculture, composting operations, sewage treatment plants) as well as natural sources.

A variety of metallic aerosols and organic compounds are known to be directly toxic to man. Most of these are seldom encountered at concentrations producing acute toxic effects. Some of these compounds, however, may be accumulated and stored in body tissues over extended periods of time. Some organic compounds are also suspected as having carcinogenic (cancer-causing) properties.

There are some indications that chronic exposure to nitrogen dioxide and ozone increases susceptibility to bacterial infection. Bacteria, viruses, fungi, and molds contained in viable aerosols also have the potential for producing infectious diseases if inhaled.

Effects on Animals. The effects of air pollutants on domestic animals, livestock and wildlife can be expected to be similar to the human health effects discussed above. The relative sensitivity of different species will vary considerably, however. While effects of pollutants on laboratory animals, domestic pets and livestock have received some study, effects on wildlife have received very little study.

A number of fish kills in the northeastern United States and in Scandinavia have been attributed to pH changes in lakes and ponds produced by frequent acid rains. In the San Gabriel Mountains of San Bernardino County, older bighorn sheep have been found to be totally or partially blind from what appear to be cataracts (white blotches on the eyeball). This eye damage has been noted only in those parts of the bighorn range subject to high oxidant concentrations (Taylor, *et.al.*, 1973). No study has yet been made to determine whether this condition is in fact caused by air pollution.

Effects on Vegetation. Air pollutants have been reported as affecting vegetation through three types of processes: direct physiological effects (Table F); altered susceptibility to other environmental stresses; and changes in soil properties affecting plants. Direct physiological effects of air pollution may result in visible symptoms of injury to leaves, stems, flowers or roots; hidden symptoms are evidenced as changes in plant metabolism and growth rates.

Air pollutants which have been identified as causing vegetation damage include sulfur dioxide, ozone, peroxyacyl nitrates, nitric oxide, nitrogen dioxide, ethylene, various fluoride compounds, and various particulates. The exact mechanisms by which various air pollutants exert their effects are not fully understood. Most pollutants appear to affect the structure and permeability of cell membranes, at least at high dosages. Other observed effects include destruction of

Table F

EFFECTS OF AIR POLLUTANTS ON VEGETATION

Pollutant	Sources	Plant Symptoms of Injury	Injury Threshold	
			Parts per Million (ppm)	*Periods of Exposure*
Sulfur dioxide (SO_2)	Combustion of coal, fuel oil, and petroleum; oil refineries	Bleached areas on leaves; yellowing of leaves; growth suppression; leaf-fall; reduction in yield	0.3 0.05	8 hours season
Nitrogen dioxide (NO_2)	High-temperature combustion of gasoline, oil, gas, and coal in internal combustion engines and power plants; manufacture of acids	Dead spots between veins and on margins of leaves	2.5 0.5	4 hours season
Hydrogen fluoride (HF)	Phosphate rock processing; aluminum refining; iron smelting; brick and ceramic works; fiber glass manufacturing	Dead tip and margin of leaves; yellowing of leaves; leaf-fall; dwarfing; lower yield	0.0001	5 weeks
Chlorine (Cl_2)	Leaks in chlorine storage tanks; hydrochloric acid mist	Bleaching between veins and dead tip and margin of leaves; defoliation	0.10	2 hours
Ethylene (CH_2)	Automobile and truck exhaust; incomplete combustion of coal, gas, and oil; chemical manufacture	Yellowing of leaves; leaf-fall; failure of flower to open; flower dropping; stimulation of lateral growth	0.05	6 hours
Ozone (O_3)	Photochemical reaction of hydrocarbons and nitrogen oxides from fuel combustion (esp. in automobiles); refuse burning; and evaporation from petroleum products and organic solvents	Flecks and bleached spots on leaves; early leaf-fall; growth suppression	0.03	4 hours
Peroxyacetyl nitrate (PAN)	Same sources as ozone	Discoloration (silvering or bronzing) on undersurface of young leaves.	0.01	6 hours

Source: Detwyler, 1972.

chlorophyll and other pigments; enzyme inactivation; alterations of amino acid composition; altered respiration rates; influence on the control of stomatal openings; and possible mutagenic effects. Dry particulates deposited on plant surfaces appear to affect plants by reducing the level of sunlight reaching plant cells.

Combinations of two or more pollutants often produce synergistic effects. All well defined instances of synergistic effects have involved sulfur dioxide. Combinations of sulfur dioxide and ozone and of sulfur dioxide and nitrogen dioxide almost always yield synergistic or additive effects (Reinert, Heagle and Heck, 1975; Applegate and Durrant, 1969; Tingey, Reinert, Dunning and Heck, 1971, 1973; White, Hill and Bennett, 1974). Combinations of sulfur dioxide and hydrogen fluoride tend to show synergistic effects at low dosages, and either additive or antagonistic effects at higher dosages (Reinert, Heagle and Heck, 1975). Other combinations of air pollutants have received little study.

Exposure to air pollutants may increase the susceptibility of plants to temperature, water, or salinity stresses. On the other hand, some plant pathogens (especially fungi) are frequently more sensitive to certain air pollutants than is their host plant. Sulfur dioxide and certain fluoride compounds are especially toxic to many fungi. Ozone, on the other hand, is often more toxic to the host plant than it is to fungi or bacteria (Treshow, 1975). Bacteria appear to be generally insensitive to air pollutants at concentrations which damage plants (Heagle, 1973). Air pollution damage to vegetation often increases the susceptibility of plants to damage by insect pests (Heagle, 1973; Taylor, et.al., 1973).

Deposition of some particulates and acid precipitation have the potential for altering soil chemistry in ways which adversely affect some plants.

The extent of air pollution damage to vegetation in California is receiving increasing attention. In 1974, fluoride damage was reported from Alameda, Contra Costa, Marin, Monterey and Riverside Counties; sulfur dioxide damage was reported from Contra Costa and Sonoma Counties; peroxyacyl nitrate damage was reported from Butte, Placer, Riverside, San Bernardino, San Diego, Santa Barbara, Sutter, and Ventura Counties; and ozone damage was reported from Alameda, Contra Costa, El Dorado, Orange, Riverside, San Bernardino, San Diego, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, and Ventura Counties, as well as throughout the San Joaquin Valley (Millecan, 1976).

The economic value of air pollution damage to agricultural crops in California has been estimated at $100-132 million per year (Environmental Science and Technology, 1970; Hindawi, 1970) when the economic value of reduced crop yields are considered. Millecan (1976), however, has estimated the value of crop damage in California at $16.1 million for 1970, $19.1 million for 1971, $17.4 million for 1972, $35.2 million for 1973, and $55.1 million for 1974. These values do not completely account for reductions in crop yields, and do not include the value of losses attributable to crop changes forced by air pollution levels. The 1970-74 increase in crop damage primarily reflects increasing crop values, not more extensive damage.

Behavioral and Psychological Effects

The effects of air pollution on people's behavior and attitudes has received little study. Possible effects include increased incidences of psychosomatic illness and personality changes induced by discomfort due to irritating or other health effects of air pollution, noxious odors, etc. On the other hand, increased levels of light-scattering aerosols can produce intense sunsets and sunrises.

APPENDIX G

SUPPORTING DATA FOR EMISSIONS FORECASTS

Table A

POPULATION VALUES USED FOR AIR QUALITY ANALYSIS

Geographic Area	Forecast Basis	Forecast Year					
		1972	1975	1980	1985	1990	1995
Air Basin	Series II[1]	1,432,100[2]	1,554,700	1,768,200	1,986,100	2,222,900	2,453,700
	Series IV[3]	1,432,100[4]	1,547,600	1,753,300	1,981,300	2,202,200	2,400,300
Metro Service Area	Series II[1]	1,172,800[5]	1,272,800	1,449,700	1,634,300	1,820,500	2,004,400
	Series IV[3]	1,172,800[6]	1,259,200	1,403,900	1,564,100	1,722,100	1,863,200

NOTES AND SOURCES:

[1] San Diego Comprehensive Planning Organization, 1974c. This version of the Series II forecast was also used in the RAQS studies and by Lowry & Associates, 1976.

[2] "Air Pollution Trends" report, San Diego Air Quality Planning Team, 1975b, page B-3.

[3] San Diego Comprehensive Planning Organization, 1977c.

[4] Assumed equal to Series II value.

[5] Back-calculated from 1973 population value based on 1973-1975 logarithmic growth rate; all data from San Diego Comprehensive Planning Organization, 1974c.

[6] Assumed equal to value calculated from Series II data.

Table B

AVERAGE SUMMER WEEKDAY VMT LEVELS UNDER DIFFERENT DEVELOPMENT ASSUMPTIONS
(VMT in millions)

Geographic Area	Forecast Basis	Forecast Year					
		1972	1975	1980	1985	1990	1995
Air Basin	Series II, Trends[1]	20.66	23.61[2]	29.08[2]	35.17	40.17[2]	45.23
	Series II, RTP[3]	20.66	22.96[2]	27.12[2]	31.60	35.85[2]	40.10
	Series IV[4]	20.66[5]	22.30	26.57[6]	31.50	37.46[6]	43.50
Metro Service Area	Series II, Trends[7]	16.92	19.33	23.84	28.94	32.90	36.95
	Series II, RTP[7]	16.92	18.80	22.23	26.00	29.36	32.76
	Series IV[7]	16.92	18.14	21.28	24.87	29.29	33.77

NOTES AND SOURCES:

[1] "Air Pollution Trends" report, San Diego Air Quality Planning Team, 1975b, page D-10, Existing Trends VMT forecast. These VMT values are based on Series II population forecasts presented on page B-3 of the "Air Pollution Trends" report, not the CPO "Existing Trends" population forecast presented on page D-11 of that report (Richard Grob, CPO, pers. comm.).

[2] Extrapolated value assuming a linear change in per capita daily VMT rates, using Series II population forecasts (see Table A of this appendix).

[3] "Air Pollution Trends" report, San Diego Air Quality Planning Team, 1975b, page D-10, Regional Transportation Plan (RTP) VMT forecast. These VMT values are based on Series II population forecasts presented on page B-3 of the "Air Pollution Trends" report, not the CPO "Existing Trends" population forecast presented on page D-11 of that report (Richard Grob, CPO, pers. comm.).

[4] Chad Lambrith, Caltrans, pers. comm.

[5] Assumed equal to the value given in the "Air Pollution Trends" report.

[6] Extrapolated value assuming a linear change in per capita daily VMT rates, using preliminary Series IV population forecasts from San Diego Comprehensive Planning Organization, 1977 (see Table A of this appendix).

[7] Calculated from Air Basin VMT levels according to appropriate population ratios for Metro Service Area vs. Air Basin (see Table A of this appendix for Series II and Series IV population forecasts).

Table C

RAQS EMISSIONS FORECAST, SAN DIEGO AIR BASIN
(tons per day)

Emissions Source Category	1972						1980						1985					
	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part
Process Loss	140.5	110.0	0	0.0	0.0	31.7	144.3	91.2	5	7.2	0.4	28.3	160.7	100.1	5	7.2	0.4	32.5
Combustion	2.0	2.0	79	30.4	5.9	11.4	3.8	3.8	63	95.2	8.7	23.7	3.4	3.4	53	72.5	8.3	19.9
Motor Vehicles	180.9	153.5	168	5.2	1,163.7	14.5	130.2	114.1	171	6.3	839.8	20.0	108.8	94.9	150	7.1	706.1	24.0
Aircraft	10.1	9.5	3	0.5	25.5	0.3	11.7	11.0	3	0.6	30.1	0.4	12.3	11.5	3	0.6	29.8	0.4
Miscellaneous	4.6	3.9	1	0.3	32.1	49.1	5.6	4.8	1	0.3	39.6	49.2	6.3	5.3	1	0.3	44.5	49.4
TOTAL	338.1	279.0	251	36.4	1,227.2	107.0	295.6	224.8	242	109.6	918.6	121.5	291.4	215.2	211	87.7	789.0	126.1

Emissions Source Category	1990						1995					
	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part
Process Loss	179.0	109.9	5	7.2	0.4	32.7	197.2	119.3	5	7.2	0.4	36.9
Combustion	3.7	3.7	56	74.4	9.0	21.0	3.9	3.9	59	76.6	9.7	22.2
Motor Vehicles	96.9	86.1	127	8.4	646.3	27.1	92.3	81.2	129	10.0	694.2	30.8
Aircraft	12.9	12.1	3	0.6	29.4	0.4	13.3	12.7	2	0.7	28.8	0.4
Miscellaneous	7.0	6.0	1	0.3	49.7	49.5	7.8	6.6	1	0.3	54.9	49.7
TOTAL	299.4	217.8	190	91.1	734.8	130.8	314.5	223.6	195	94.8	788.0	140.1

NOTES AND SOURCES:

TOG	Total organic gases (hydrocarbons)	SO_x	Sulfur oxides
ROG	Reactive organic gases (hydrocarbons)	CO	Carbon monoxide
NO_x	Oxides of nitrogen	Part	Particulates

TOG, SO_x, CO and Particulate values from "Air Pollution Trends" report, San Diego Air Quality Planning Team, 1975b, Figures H-7, H-8, H-10 and H-11.

ROG values from "RAQS" report, San Diego Air Quality Planning Team, 1976a, page 32.

NO_x values from "RAQS Technical Documentation" report, San Diego Air Quality Planning Team, 1976b, page 11.

Table D

RAQS EMISSIONS FORECAST EXTRAPOLATED TO METRO SERVICE AREA
(TONS PER DAY)

Emissions Source Category	1972						1980						1985					
	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part
Process Loss	115.1	90.1	0.0	0.0	0.0	26.0	118.3	74.8	4.1	5.9	0.3	23.2	132.2	82.4	4.1	5.9	0.3	26.7
Combustion	1.6	1.6	64.7	24.9	4.8	9.3	3.1	3.1	51.7	78.1	7.1	19.4	2.8	2.8	43.6	59.7	6.8	16.4
Motor Vehicles	148.2	125.7	137.6	4.3	953.0	11.9	106.7	93.5	140.2	5.2	688.5	16.4	89.5	78.1	123.4	5.8	581.0	19.7
Aircraft	8.3	7.8	2.5	0.4	20.9	0.2	9.6	9.0	2.5	0.5	24.7	0.3	10.1	9.5	2.5	0.5	24.5	0.3
Miscellaneous	3.8	3.2	0.8	0.2	26.3	40.2	4.6	3.9	0.8	0.2	32.5	40.3	5.2	4.4	0.8	0.2	36.6	40.6
TOTAL	276.9	228.4	205.6	29.8	1,005.0	87.6	242.3	184.4	199.2	89.9	753.1	99.7	239.9	177.1	174.4	72.2	649.3	103.8

Emissions Source Category	1990						1995					
	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part
Process Loss	146.6	90.0	4.1	5.9	0.3	26.8	161.1	97.5	4.1	5.9	0.3	30.1
Combustion	3.0	3.0	45.9	60.9	7.4	17.2	3.2	3.2	48.2	62.6	7.9	18.1
Motor Vehicles	79.4	70.5	104.0	6.9	529.3	22.2	75.4	66.3	105.4	8.2	567.1	25.2
Aircraft	10.6	9.9	2.5	0.5	24.1	0.3	10.9	10.4	1.6	0.6	23.5	0.3
Miscellaneous	5.7	4.9	0.8	0.2	40.7	40.5	6.4	5.4	0.8	0.2	44.8	40.6
TOTAL	245.3	178.4	157.2	74.4	601.8	107.0	256.9	182.7	160.1	77.4	643.7	114.4

Notes and Sources:

RAQS forecast for Air Basin (Table C of this appendix) extrapolated to metro service area according to relative population levels using Series II population forecasts from Table A of this appendix.

Table E

SERIES IV ADJUSTMENT OF RAQS EMISSIONS FORECAST, SAN DIEGO AIR BASIN
(tons per day)

Emissions Source Category	1972						1980						1985					
	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part
Process Loss	140.5	110.0	0.0	0.0	0.0	31.7	143.1	90.4	5.0	7.1	0.4	28.1	160.3	99.9	5.0	7.2	0.4	32.4
Combustion	2.0	2.0	79.0	30.4	5.9	11.4	3.8	3.8	62.5	94.4	8.6	23.5	3.4	3.4	52.9	72.3	8.3	19.9
Motor Vehicles	180.9	153.5	168.0	5.2	1,163.7	14.5	119.0	104.3	156.2	5.8	767.3	18.3	97.4	85.0	134.3	6.4	632.4	21.5
Aircraft	10.1	9.5	3.0	0.5	25.5	0.3	11.6	10.9	3.0	0.6	29.8	0.4	12.3	11.5	3.0	0.6	29.7	0.4
Miscellaneous	4.6	3.9	1.0	0.3	32.1	49.1	5.6	4.8	1.0	0.3	39.3	48.8	6.3	5.3	1.0	0.3	44.4	49.3
TOTAL	338.1	279.0	251.0	36.4	1,227.2	107.0	283.0	214.1	227.6	108.2	845.4	119.0	279.7	205.0	196.2	86.8	715.2	123.4

Emissions Source Category	1990						1995					
	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part
Process Loss	177.3	108.9	5.0	7.1	0.4	32.4	192.9	116.7	4.9	7.0	0.4	36.1
Combustion	3.7	3.7	55.5	73.7	8.9	20.8	3.8	3.8	57.7	74.9	9.5	21.7
Motor Vehicles	90.4	80.3	118.4	7.8	602.7	25.3	88.8	78.1	124.1	9.6	667.6	29.6
Aircraft	12.8	12.0	3.0	0.6	29.1	0.4	13.0	12.4	2.0	0.7	28.2	0.4
Miscellaneous	6.9	5.9	1.0	0.3	49.2	49.0	7.6	6.5	1.0	0.3	53.7	48.6
TOTAL	291.1	210.8	182.8	89.6	690.4	127.9	306.1	217.5	189.6	92.6	759.4	136.4

Notes and Sources:

RAQS emissions forecast for Air Basin (Table C of this appendix) adjusted by ratio of Series IV population to Series II population (see Table A of this appendix) for all source categories except motor vehicles. Motor vehicle emissions adjusted by ratio of Series IV VMT to Series II trends VMT (see Table B of this appendix).

Table F

SERIES IV ADJUSTMENT TO RAQS EMISSIONS FORECAST, METRO SERVICE AREA (TONS PER DAY)

Emissions Source Category	1972						1980						1985					
	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part
Process Loss	115.1	90.1	0.0	0.0	0.0	26.0	114.6	72.4	4.0	5.7	0.3	22.5	126.6	78.8	3.9	5.7	0.3	25.6
Combustion	1.6	1.6	64.7	24.9	4.8	9.3	3.0	3.0	50.0	75.6	6.9	18.8	2.7	2.7	41.7	57.1	6.5	15.7
Motor Vehicles	148.2	125.7	137.6	4.3	953.0	11.9	95.3	83.5	125.1	4.6	614.5	14.6	76.9	67.1	106.1	5.0	499.3	17.0
Aircraft	8.3	7.8	2.5	0.4	20.9	0.2	9.3	8.7	2.4	0.5	23.9	0.3	9.7	9.1	2.4	0.5	23.5	0.3
Miscellaneous	3.8	3.2	0.8	0.2	26.3	40.2	4.4	3.8	0.8	0.2	31.4	39.1	5.0	4.2	0.8	0.2	35.0	38.9
TOTAL	276.9	228.4	205.6	29.8	1,005.0	87.6	226.6	171.5	182.3	86.6	677.1	95.3	220.8	161.8	154.9	68.5	564.7	97.5

Emissions Source Category	1990						1995					
	TOG	ROG	NO_x	SO_x	CO	Part	TOG	ROG	NO_x	SO_x	CO	Part
Process Loss	138.7	85.1	3.9	5.6	0.3	25.3	149.7	90.6	3.8	5.5	0.3	28.0
Combustion	2.9	2.9	43.3	57.6	7.0	16.3	3.0	3.0	44.8	58.2	7.4	16.9
Motor Vehicles	70.7	62.8	92.6	6.1	471.3	19.8	68.9	60.6	96.3	7.5	518.3	23.0
Aircraft	10.0	9.4	2.3	0.5	22.8	0.3	10.1	9.6	1.5	0.5	21.9	0.3
Miscellaneous	5.4	4.6	0.8	0.2	38.5	38.3	5.9	5.0	0.8	0.3	41.7	37.7
TOTAL	227.6	164.8	143.0	70.0	539.8	100.0	237.6	168.8	147.2	71.9	589.5	105.9

Notes and Sources:

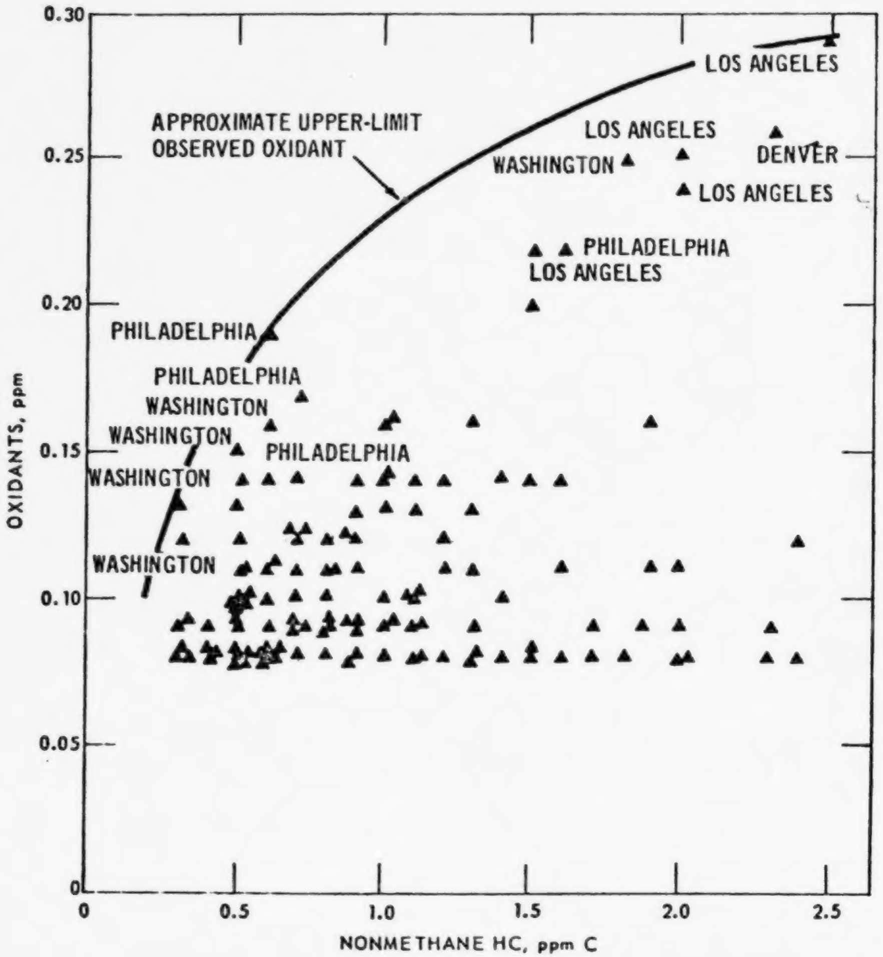
RAQS emissions forecast for Air Basin (Table C of this appendix) adjusted by ratio of Series IV metro service area population to Series II population forecast for Air Basin (see Table A of this appendix) for all source categories except motor vehicles. Vehicle emissions adjusted by ratio of Series IV metro service area VMT to Series II trends VMT for Air Basin (see Table B of this appendix).

APPENDIX H

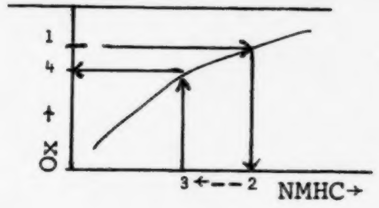
EPA'S "APPENDIX J" PROCEDURES

Figure A

OXIDANT FORECASTING USING EPA'S UPPER LIMIT CURVE



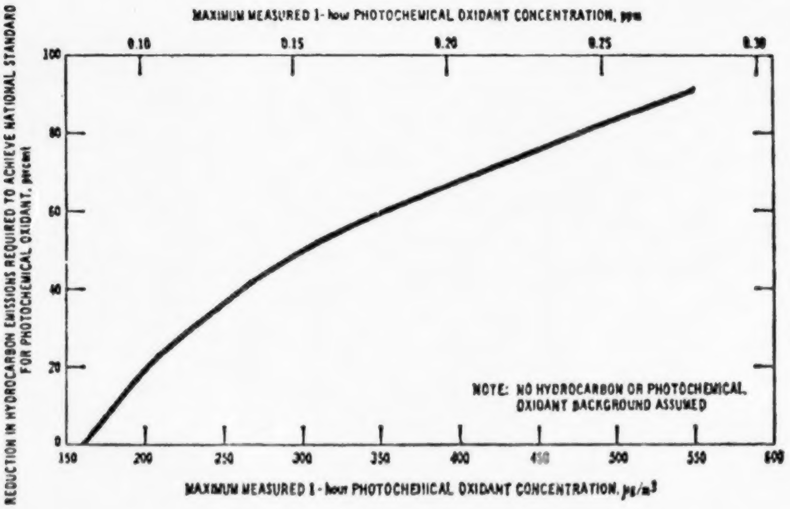
Procedure:



1. Identify peak base year 1-hour oxidant level.
2. Determine base value for NMHC air quality level to be used in a linear rollback procedure.
3. Use linear rollback procedure to forecast future NMHC air quality level (reactive organic gas emissions as precursors).
4. Estimate future oxidant level from curve.

Figure B

EPA'S APPENDIX J ROLLBACK MODEL FOR PHOTOCHEMICAL OXIDANTS



Required hydrocarbon emission control as a function of photochemical oxidant concentration.

APPENDIX I

EFFECTIVENESS OF RAQS TACTICS

Table A

EFFECTIVENESS OF ADOPTED RAQS TACTICS IN REDUCING ROG EMISSIONS

TACTIC		TACTIC EFFECTIVENESS					
		% ROG Reduction for Appropriate Major Source Category			ROG Emissions Reduction, Air Basin, Tons per Day		
Designation	Description	1985	1990	1995	1985	1990	1995
A2	General aviation aircraft evaporative controls on new models in 1980.	7.21	14.96	23.49	0.83	1.80	2.91
P1	Dry cleaners to implement product change/ controls on equipment to give 50% RHC reduction by 1980.	1.65	1.50	1.38	1.65	1.63	1.61
P2	Surface cleaning products RHC emissions reduced 50% by product change, alternate process or capture of vapors.	13.15	13.41	13.61	13.14	14.60	15.88
P3	Architectural surface coatings (paints) shift to non-reactive bases and/or control of exhaust vapors. RHC reduction targets: 1980 = 25%, 1985 = 60%, 1990-2000 = 90%.	15.94	24.33	24.75	15.92	26.50	28.88
P4	Industrial surface coatings (paints) shift to non-reactive bases and/or control of exhaust vapors. RHC reduction targets: 1980 = 30%, 1985 = 60%, 1990-2000 = 90%.	14.98	23.27	24.23	14.97	25.34	28.28
P7	Vapor recovery equipment effectiveness improved to 95% by 1985. Extends control rules to cover certain exempt facilities.	2.79	2.54	2.28	2.79	2.77	2.66
P9	Gasoline volatility reduction during summer months from FEVI 12 to FEVI 10. If implemented, there is less RHC reduction from evaporative control tactics.	3.22p 20.68m	2.85p 22.05m	2.47p 19.18m	3.22p 17.58m	3.10p 17.71m	2.88p 14.98m
M1	Inspection and maintenance of on-road motor vehicles to give 7% reduction in RHC emissions below nominal levels for pre-1975 model light-duty vehicles and all heavy-duty vehicles, motorcycles and Mexican registered vehicles.	2.12	1.93	2.00	1.80	1.55	1.56

TACTIC		TACTIC EFFECTIVENESS					
		% ROG Reduction for Appropriate Major Source Category			ROG Emissions Reduction, Air Basin, Tons per Day		
Designation	Description	1985	1990	1995	1985	1990	1995
M3	California light-duty vehicle emission standards and adopted 6 gm evaporative standard for post-1977 model years.	10.88	10.71	7.62	9.25	8.60	5.95
M4	California 5/25 exhaust emission standard and evaporative standard for heavy-duty vehicles for post-1977 model years.	4.46	3.15	4.05	3.79	2.53	3.16
M5	California street motorcycle emission standards three-phase reduction regulations of 10 gm/km HC in 1978, 5 gm/km in 1980, and 1 gm/km in 1982 and after.	1.28	1.55	2.01	1.09	1.24	1.57
M7	Additional evaporative controls on light-duty vehicles meeting a 2 gm HC standard beginning with 1980 model year.	2.31	3.99	6.73	1.96	3.20	5.26
M9	Additional evaporative emission controls on light-duty vehicles meeting a 1 gm HC standard beginning with 1982 model year.	4.44	4.10	1.93	3.77	3.29	1.51
M14	Emission standards for off-road heavy-duty vehicles same as 5/25 standard for on-road class beginning with 1980 models.	0.16	2.03	4.42	0.14	1.63	3.45
T1 (modified)	Reconcile differences between Regional Comprehensive Plan, Regional Transportation Plan, and local general plans.	3.31	3.38	3.77	2.81	2.71	2.94
T2	Maximum carpools/vanpools plus incentives. Assume implementation by 1980 and 7% VMT and 5% trip reduction for light-duty vehicles.	1.50	1.16	1.18	1.28	0.93	0.92
T3	Communication substitutes and home goods delivery to reduce need for personal travel. VMT and trip reduction targets for light-duty vehicles: 1980 = 2%, 2000 = 10%.	1.90	3.37	3.45	1.62	2.71	2.69

TACTIC		TACTIC EFFECTIVENESS					
		% ROG Reduction for Appropriate Major Source Category			ROG Emissions Reduction, Air Basin, Tons per Day		
Designation	Description	1985	1990	1995	1985	1990	1995
T7	Maximum bicycle system in addition to that included in tactic T-1. Includes adopted regional system, local networks, employer incentives, bike-and-ride, and storage facilities.	1.26	1.14	1.16	1.07	0.92	0.91
X2	Home utility engines RHC emissions reduced by controls and/or shift to low polluting power sources with 50% reduction from new equipment by 1980.	24.06	47.50	47.73	1.28	2.80	3.10
TOTAL EMISSIONS REDUCTION		48.75	59.56	60.29	99.94	125.56	131.12

NOTES AND SOURCES:

Adopted tactics identified in San Diego Comprehensive Planning Organization, 1976a (see Appendix B of this EIS). The City of San Diego has not yet adopted tactic T1 (modified).

Percent ROG reductions based on data and procedures in San Diego Air Quality Planning Team, 1976b.

ROG emissions reduction for Series IV Air Basin forecast based on percentage factors shown in this table and emissions forecast in Table E of Appendix G.

For Tactic P9, (p) = process loss source category; (m) = motor vehicle source category.

Table B

EFFECTIVENESS OF ADOPTED RAQS TACTICS IN REDUCING PROJECTED CO EMISSIONS

			Forecast Year*		
Designation	Description	Factors Influencing Tactic Effectiveness	1985	1990	1995
M1	Mandatory inspection and maintenance program.	Not evaluated; variable effectiveness depending on precise program implemented.	---	---	---
M4	California 5/25 exhaust emission standards for heavy-duty vehicles, effective in 1978.	HDG exhaust CO as % of total CO[1]	38.36	44.48	48.04
		% HDG VMT by affected trucks[2]	65.85	83.35	91.64
		CO reduction for affected trucks[3]	58	58	58
		Tactic effectiveness as overall % CO reduction.	14.65	21.50	25.53
		HDD exhaust CO as % of total CO[1]	1.82	2.20	2.41
		% HDD VMT by affected trucks[2]	64.40	83.38	91.74
		CO reduction for affected trucks[3]	58	58	58
		Tactic effectiveness as overall % CO reduction	0.68	1.06	1.28
M14	California 5/25 applied to heavy-duty off-road vehicles, effective in 1980.	Off-road HD exhaust CO as % of total CO[1]	9.98	10.57	10.60
		% vehicles affected[4]	5	50	100
		CO reduction for affected vehicles[3]	57	57	57
		Tactic effectiveness as overall % CO reduction	0.28	3.01	6.04
T1	Differences between local general plans and the Regional Comprehensive Plan and Regional Transportation Plan reconciled.	LDV exhaust CO as % of total CO[1]	32.02	22.74	18.83
		VMT reduction for LDVs[3]	12.1	12.8	13.4
		Street motorcycle exhaust CO as % of total CO[1]	3.61	3.86	4.22
		VMT reduction for street motorcycles[3]	11.6	12.3	13.1
		Mexican vehicle exhaust CO as % of total CO[1]	1.56	1.05	0.87
		VMT reduction for Mexican vehicles[3]	11.7	12.7	13.5
		Tactic effectiveness as overall % CO reduction	4.48	3.52	3.09
T2	Maximum carpool and vanpool plus incentives, effective by 1980.	LDV exhaust CO as % of total CO[1]	32.02	22.74	18.83
		VMT reduction for LDVs[4]	7	7	7
		Tactic effectiveness as overall % CO reduction	2.24	1.59	1.32
T3	Communication substitutes and home goods delivery	LDV exhaust CO as % of total CO[1]	32.02	22.74	18.83
		VMT reduction for LDVs[4]	5	10	10
		Tactic effectiveness as overall % CO reduction	1.60	2.27	1.88
T7	Maximum bicycle system in addition to tactic T1	LDA exhaust CO as % of total CO[1]	19.27	12.01	9.19
		VMT reduction for LDAs[4]	1	1	1
		Tactic effectiveness as overall % CO reduction	0.19	0.12	0.09
CUMULATIVE REDUCTION FROM PROJECTED CO EMISSIONS			24.12	33.07	39.23

NOTES AND SOURCES:

HDG	Heavy-duty gasoline-powered vehicles
HDD	Heavy-duty diesel-powered vehicles
HD	Heavy-duty vehicles (whether diesel or gasoline powered)
LDV	Light-duty vehicles (autos and light-duty trucks)
LDA	Light-duty autos

* All figures are calculated in percent.

[1] San Diego Air Quality Planning Team, 1975b, Figure H-8.

[2] California Air Resources Board, 1977c, Tables 4-11 and 5-10.

[3] San Diego Air Quality Planning Team, 1976b.

[4] San Diego Air Quality Planning Team, 1976b.

TABLE C

EFFECTIVENESS OF DESIGNATED BACKUP TACTICS IN REDUCING ROG EMISSIONS, ASSUMING IMPLEMENTATION OF CPO-ADOPTED TACTICS

TACTICS		% ROG REDUCTION FOR APPROPRIATE MAJOR SOURCE CATEGORY			OVERALL % REDUCTION IN TOTAL ROG EMISSIONS		
DESIGNATIONS	DESCRIPTION	1985	1990	1995	1985	1990	1995
P5	Architectural surface coatings (paints). Same tactic as P3 except that 90% reduction target advanced to 1985. Emissions reduction are additive to P3.	7.99	0	0	3.71	0	0
P6	Industrial surface coatings (paints). Same tactic as P4 except 90% reduction target advanced to 1985. Emissions reduction are additive to P4.	7.51	0	0	3.49	0	0
P8	Vapor recovery equipment effectiveness improved to 95% by 1980. Same tactics as P7 except that 95% effectiveness requirement advanced 5 years. Emissions reduction are additive to P7.	0	0	0	0	0	0
M6	100,000-mile emission warranty for light-duty passenger vehicles beginning with 1980 models.	1.02	1.14	1.43	0.45	0.45	0.52
M10	100,000-mile emission warranty for light-duty trucks beginning with 1980 model year.	1.64	2.93	5.17	0.72	1.16	1.88
M11	Retrofit exhaust oxidation catalysts on 1970-77 heavy-duty gasoline-powered vehicles. Assume 60% reduction in RHC emissions.	2.21	1.28	0.37	0.98	0.51	0.13
T12	Transit fare reduction to zero on public bus system.	0.95	0.93	0.86	0.42	0.37	0.31
T14	Traffic flow improvements to minimize congestion on non-freeway streets and increase average speed 10%.	0.42	0.46	0.49	0.19	0.18	0.18
Total ROG Emissions Reduction					9.96	2.67	3.02

NOTES AND SOURCES

ROG = Reactive Organic Gas

Designated backup tactics identified from San Diego Air Quality Planning Team, 1976a, page 45. Tactics P7 and T1 (modified) have been adopted by CPO. Tactic T5 duplicates certain portions of Tactic T1.

Percent ROG reductions based on data and procedures presented in San Diego Air Quality Team, 1976b.

TABLE D

EFFECTIVENESS OF REMAINING RAQS TACTICS IN REDUCING ROG EMISSIONS, ASSUMING IMPLEMENTATION OF THE CPO-ADOPTED TACTICS AND THE DESIGNATED BACKUP TACTICS

TACTICS		% ROG REDUCTION FOR APPROPRIATE MAJOR SOURCE CATEGORY			OVERALL % REDUCTION IN TOTAL ROG EMISSIONS		
DESIGNATIONS	DESCRIPTION	1985	1990	1995	1985	1990	1995
A1	Tow commercial jets from terminal gates to head of runway for takeoff.	4.70	4.46	3.78	0.25	0.25	0.21
C1	Energy conservation measures with incentives to use non-polluting sources of energy and reduce RHC emissions from combustion sources.	17.65	27.03	38.46	0.28	0.46	0.67
M2	Inspection and maintenance of off-road motor vehicles to give 7% reduction in RHC emissions below nominal levels.	0.62	0.74	0.85	0.27	0.29	0.31
M8	Retrofit evaporative controls on 1970-77 light-duty vehicles meeting a 12 gm HC standard.	2.67	1.19	0	1.18	0.47	0
M12	Retrofit evaporative controls on 1970-77 gasoline-powered heavy-duty vehicles meeting a standard of 12 gm per "hot soak" phase.	0.11	0.06	0	0.05	0.03	0
M13	Emission standards for off-road recreation vehicles same as equivalent on-road vehicles, beginning in 1978.	0.19	0.12	0.13	0.08	0.05	0.05
M15	Emission standards for farm equipment meet 5/25 certification beginning in 1980.	0.02	0.19	0.39	0.01	0.08	0.14
T4	Gasoline rationing for light-duty vehicles from 1977 to 1990 with 15% curtailment of gasoline consumption for non-commercial vehicles.	1.03 (p) 2.32 (m)	0.91 (p) 2.03 (m)	0 (p) 0 (m)	0.48 (p) 1.02 (m)	0.46 (p) 0.80 (m)	0 (p) 0 (m)
T6	Demand responsive transit system. Dial-A-Ride on a scale (900 vans) to reduce light-duty vehicle trips in 1985 by 1%.	0.34	0.17	0.17	0.15	0.07	0.06
T8	Inter-urban transportation alternatives with improved bus, air and rail transit, terminal expansion and upgrade equipment.	Not analyzed due to complex relationship with other tactics.					
T9	Balanced communities - land use/transportation patterns. Motor vehicle travel minimized by balancing land use, population and employment within each community.	Not analyzed by RAQS study.					
T10	Maximum urban transit with concentrated development oriented according to transit availability.	Conflicts with tactic T-1 (modified).					

TACTICS		% ROG REDUCTION FOR APPROPRIATE MAJOR SOURCE CATEGORY			OVERALL % REDUCTION IN TOTAL ROG EMISSIONS		
DESIGNATIONS	DESCRIPTION	1985	1990	1995	1985	1990	1995
T11	Tax on second and third car ownership.	Not analyzed by RAQS study.					
T13	Commercial goods transported via less polluting vehicles to shift 20% of gasoline truck VMT to diesel; 10% to other modes.	0.23	0.23	0.20	0.10	0.09	0.09
T15	Gasoline tax at pump. Goal is 15% reduction of gasoline consumption by non-commercial light-duty vehicles (same as tactic T4). Tactic ends in 1990.	Duplicates tactic T-4.					
X1	Rail engine controls as proposed by EPA.	Not analyzed by RAQS study.					
TOTAL ROG EMISSIONS REDUCTION					3.87	3.05	1.53

NOTES AND SOURCES

ROG = Reactive Organic Gas

For tactic T4, (p) = process loss source category; (m) = motor vehicle source category. Calculations recognize influence of tactic P9.

Calculations based on data and procedures presented in San Diego Air Quality Planning Team, 1976b.

Appendix J

federal register

MONDAY, APRIL 14, 1975
WASHINGTON. D.C.

Volume 40 ■ Number 72

PART III

THE NATIONAL ARCHIVES OF THE UNITED STATES ★ 1934 ★

ENVIRONMENTAL PROTECTION AGENCY

Preparation of Environmental Impact Statements

■

Final Regulations

Title 40—Protection of Environment

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

[FRL 327-5]

PART 6—PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS

Final Regulation

The National Environmental Policy Act of 1969 (NEPA), implemented by Executive Order 11514 of March 5, 1970, and the Council on Environmental Quality's (CEQ's) Guidelines of August 1, 1973, requires that all agencies of the Federal Government prepare detailed environmental impact statements on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. NEPA requires that agencies include in their decision-making process an appropriate and careful consideration of all environmental aspects of proposed actions, an explanation of potential environmental effects of proposed actions and their alternatives for public understanding, a discussion of ways to avoid or minimize adverse effects of proposed actions and a discussion of how to restore or enhance environmental quality as much as possible.

On January 17, 1973, the Environmental Protection Agency (EPA) published a new Part 6 in interim form in the FEDERAL REGISTER (38 FR 1696), establishing EPA policy and procedures for the identification and analysis of environmental impacts and the preparation of environmental impact statements (EIS's) when significant impacts on the environment are anticipated.

On July 17, 1974, EPA published a notice of proposed rulemaking the FEDERAL REGISTER (39 FR 26254). The rulemaking provided detailed procedures for applying NEPA to EPA's nonregulatory programs only. A separate notice of administrative procedure published in the October 21, 1974, FEDERAL REGISTER (39 FR 37419) gave EPA's procedures for voluntarily preparing EIS's on certain regulatory activities. EIS procedures for another regulatory activity, issuing National Pollutant Discharge Elimination System (NPDES) discharge permits to new sources, will appear in 40 CFR 6. Associated amendments to the NPDES operating regulations, covering permits to new sources, will appear in 40 CFR 125.

The proposed regulation on the preparation of EIS's for nonregulatory programs was published for public review and comment. EPA received comments on this proposed regulation from environmental groups; Federal, State and local governmental agencies; industry; and private individuals. As a result of the comments received, the following changes have been made:

(1) Coastal zones, wild and scenic rivers, prime agricultural land and wildlife habitat were included in the criteria to be considered during the environmental review.

The Coastal Zone Management Act and the Wild and Scenic Rivers Act are intended to protect these environmentally sensitive areas; therefore, EPA should consider the effects of its projects on these areas. Protection of prime agricultural lands and wildlife habitat has become an important concern as a result of the need to further increase food production from domestic sources as well as commercial harvesting of fish and other wildlife resources and from the continuing need to preserve the diversity of natural resources for future generations.

(2) Consideration of the use of floodplains as required by Executive Order 11296 was added to the environmental review process.

Executive Order 11296 requires agencies to consider project alternatives which will preclude the uneconomic, hazardous or unnecessary use of floodplains to minimize the exposure of facilities to potential flood damage, lessen the need for future Federal expenditures for flood protection and flood disaster relief and preserve the unique and significant public value of the floodplain as an environmental resource.

(3) Statutory definitions of coastal zones and wild and scenic rivers were added to § 6.214(b).

These statutes define sensitive areas and require states to designate areas which must be protected.

(4) The review and comment period for negative declarations was extended from 15 days to 15 working days.

Requests for negative declarations and comments on negative declarations are not acted on during weekends and on holidays. In addition, mail requests often take two or three days to reach the appropriate office and several more days for action and delivery of response. Therefore, the new time frame for review and response to a negative declaration is more realistic without adding too much delay to a project.

(5) Requirements for more data in the negative declaration to clarify the proposed action were added in § 6.212(b).

Requiring a summary of the impacts of a project and other data to support the negative declaration in this document improves its usefulness as a tool to review the decision not to prepare a full EIS on a project.

(6) The definitions of primary and secondary impacts in § 6.304 were clarified.

The definitions were made more specific, especially in the issue areas of induced growth and growth rates, to reduce subjectivity in deciding whether an impact is primary or secondary.

(7) Procedures for EPA public hearings in Subpart D were clarified.

Language was added to this subpart to distinguish EPA public hearings from applicant hearings required by statute or regulation, such as the facilities plan hearings.

(8) The discussion of retroactive application (§ 6.504) was clarified and abbreviated.

The new language retains flexibility in decision making for the Regional Administrator while eliminating the ambiguity of the langauge in the interim regulation.

(9) The criteria for writing an EIS if wetlands may be affected were modified in § 6.510(b).

The new language still requires an EIS on a project which will be located on wetlands but limits the requirements for an EIS on secondary wetland effects to those which are significant and adverse.

(10) A more detailed explanation of the data required in environmental assessments (§ 6.512) was added.

Requiring more specific data in several areas, including energy production and consumption as well as land use trends and population projections, from the applicant will provide a more complete data base for the environmental review. Documentation of the applicant's data will allow EPA to evaluate the validity of this data.

(11) Subpart F, Guidelines for Compliance with NEPA in Research and Development Programs and Activities, was revised.

ORD simplified this subpart by removing the internal procedures and assignments of responsibility for circulation in internal memoranda. Only the general application of this regulation to ORD programs was retained.

(12) The discussions of responsibilities and document distribution procedures were moved to appendices attached to the regulations.

These sections were removed from the regulatory language to improve the readability of the regulation and because these discussions are more explanatory and do not need to have the legal force of regulatory language.

(13) Consideration of the Endangered Species Act of 1973 was incorporated into the regulation.

EPA recognizes its responsibility to assist with implementing legislation which will help preserve or improve our natural resources.

The major issues raised on this regulation were on new and proposed criteria for determining when to prepare an EIS and the retroactive application of the criteria to projects started before July 1, 1975. In addition to the new criteria which were added, CEQ requested the addition of several quantitative criteria for which parameters have not been set. These new criteria are being discussed with CEQ and may be added to the regulation at a future date. Changes in the discussion of retroactive application of the criteria are described in item 8 above.

EPA believes that Agency compliance with the regulations of Part 6 will enhance the present quality of human life without endangering the quality of the natural environment for future generations.

Effective date: This regulation will become effective April 14, 1975.

Dated: April 3, 1975.

RUSSELL E. TRAIN,
Administrator.

Subpart A—General

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6.800 Purpose.
6.802 Definitions.
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EXHIBITS

1. (Page 1.) Notice of Intent Transmittal Memorandum Suggested Format.
(Page 2.) Notice of Intent Suggested Format.
2. Public Notice and News Release Suggested Format.
3. Negative Declaration Suggested Format.
4. Environmental Impact Appraisal Suggested Format.
5. Cover Sheet Format for Environmental Impact Statements.
6. Summary Sheet Format for Environmental Impact Statements.
7. Flowchart for Solid Waste Management Program Operations.
Appendix A—Checklist for Environmental Reviews.
Appendix B—Responsibilities.
Appendix C—Availability and Distribution of Documents.

Authority: Secs. 102, 103 of 83 Stat. 854 (42 U.S.C. 4321 et seq.)

Subpart A—General

§ 6.100 Purpose and policy.

(a) The National Environmental Policy Act (NEPA) of 1969, implemented by Executive Order 11514 and the Council on Environmental Quality's (CEQ's) Guidelines of August 1, 1973 (38 FR 20550), requires that all agencies of the Federal Government prepare detailed environmental impact statements on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. NEPA requires that agencies include in the decision-making process appropriate and careful consideration of all environmental effects of proposed actions, explain potential environmental effects of proposed actions and their aternatives for public understanding, avoid or minimize adverse effects of proposed actions and restore or enhance environmental quality as much as possible.

(b) This part establishes Environmental Protection Agency (EPA) policy and procedures for the identification and analysis of the environmental impacts of EPA nonregulatory actions and the preparation and processing of environmental impact statements (EIS's) when significant impacts on the environment are anticipated.

§ 6.102 Definitions.

(a) "Environmental assessment" is a written analysis submitted to EPA by its grantees or contractors describing the environmental impacts of proposed actions undertaken with the financial support of EPA. For facilities or section 208 plans as defined in § 6.102 (j) and (k), the assessment must be an integral, though identifiable, part of the plan submitted to EPA for review.

(b) "Environmental review" is a formal evaluation undertaken by EPA to determine whether a proposed EPA action may have a significant impact on the environment. The environmental assessment is one of the major sources of information used in this review.

(c) "Notice of intent" is a memorandum, prepared after the environmental review, announcing to Federal, regional, State, and local agencies, and to interested persons, that a draft EIS will be prepared.

(d) "Environmental impact statement" is a report, prepared by EPA, which identifies and analyzes in detail the environmental impacts of a proposed EPA action and feasible alternatives.

(e) "Negative declaration" is a written announcement, prepared after the environmental review, which states that EPA has decided not to prepare an EIS and summarizes the environmental impact appraisal.

(f) "Environmental impact appraisal" is based on an environmental review and supports a negative declaration. It describes a proposed EPA action, its expected environmental impact, and the basis for the conclusion that no significant impact is anticipated.

(g) "NEPA-associated documents" are any one or combination of: notices of intent, negative declarations, exemption certifications, environmental impact appraisals, news releases, EIS's, and environmental assessments.

(h) "Responsible official" is an Assistant Administrator, Deputy Assistant Administartor, Regional Administrator or their designee.

(i) "Interested persons" are individuals, citizen groups, conservation organizations, corporations, or other nongovernmental units, including applicants for EPA contracts or grants, who may be interested in, affected by, or technically competent to comment on the environmental impacts of the proposed EPA action.

(j) "Section 208 plan" is an areawide waste treatment management plan prepared under section 208 of the Federal Water Pollution Control Act (FWPCA), as amended, under 40 CFR Part 126 and 40 CFR Part 35, Subpart F.

(k) "Facilities plan" is a preliminary plan prepared as the basis for construction of publicly owned waste treatment works under Title II of FWPCA, as amended, under 40 CFR 35.917.

(l) "Intramural project" is an inhouse project undertaken by EPA personnel.

(m) "Extramural project" is a project undertaken by grant or contract.

§ 6.104 Summary of procedures for implementing NEPA.

(a) *Responsible official.* The responsible official shall utilize a systematic, interdisciplinary approach to integrate natural and social sciences as well as environmental design arts in planning programs and making decisions which are subject to NEPA review. His staff may be supplemented by professionals from other agencies, universities or consultants whenever in-house capabilities are insufficiently interdisciplinary.

(b) *Environmental assessment.* Environmental assessments must be submitted to EPA by its grantees and contractors, as required in Subparts E, F, G, and H of this part. The assessment is used by EPA to decide if an EIS is required and to prepare one if necessary.

(c) *Environmental review.* Environmental reviews shall be made of proposed and certain ongoing EPA actions as required in § 6.106(c). This process shall consist of a study of the action to identify and evaluate the environmental impacts of the action. Types of grants, contracts and other actions requiring study are listed in the subparts following

Subpart D. The process shall include a review of any environmental assessment received to determine whether any significant impacts are anticipated, whether any changes can be made in the proposed action to eliminate significant adverse impacts, and whether an EIS is required. EPA has overall responsibility for this review, although its grantees and contractors will contribute to the review through their environmental assessments.

(d) *Notice of intent and EIS's.* When an environmental review indicates that a significant environmental impact may occur and the significant adverse impacts cannot be eliminated by making changes in the project, a notice of intent shall be published, and a draft EIS shall be prepared and distributed. After external coordination and evaluation of the comments received, a final EIS shall be prepared and distributed. EIS's should be prepared first on those proposed actions with the most adverse effects which are scheduled for earliest implementation and on other proposed actions according to priorities assigned by the responsible official.

(e) *Negative declaration and environmental impact appraisal.* When the environmental review indicates no significant impacts are anticipated or when the project is changed to eliminate the significant adverse impacts, a negative declaration shall be issued. For the cases in Subparts E, F, G, and H of this part, an environmental impact appraisal shall be prepared which summaries the impacts, alternatives and reasons an EIS was not prepared. It shall remain on file and be available for public inspection.

§ 6.106 Applicability.

(a) *Administrative actions covered.* This part applies to the administrative actions listed below. The subpart referenced with each action lists the detailed NEPA procedures associated with the action. Administrative actions are:

(1) Development of EPA legislative proposals;

(2) Development of favorable reports on legislation initiated elsewhere and not accompanied by an EIS, when they relate to or affect matters within EPA's primary areas of responsibility;

(3) For the programs under Title II of FWPCA, as amended, those administrative actions in § 6.504;

(4) For the Office of Research and Development, those administrative actions in § 6.604;

(5) For the Office of Solid Waste Management Programs, those administrative actions in § 6.702;

(6) For construction of special purpose facilities and facility renovations, those administrative actions in § 6.804; and

(7) Development of an EPA project in conjunction with or located near a project or complex of projects started by one or more Federal agencies when the cumulative effects of all the projects will be major allocations of resources or foreclosures of future land use options.

(b) *Administrative actions excluded.* The requirements of this part do not apply to environmentally protective regulatory activities undertaken by EPA, nor to projects exempted in § 6.504, § 6.604, and § 6.702.

(c) *Application to ongoing actions.* This regulation shall apply to uncompleted and continuing EPA actions initiated before the promulgation of these procedures when modifications of or alternatives to the EPA action are still available, except for the Title II construction grants program. Specific application for the construction grants program is in § 6.504(c). An EIS shall be prepared for each project found to have significant environmental effects as described in § 6.200.

(d) *Application to legislative proposals.* (1) As noted in paragraphs (a) (1) and (2) of this section, EIS's or negative declarations shall be prepared for legislative proposals or favorable reports relating to legislation which may significantly affect the environment. Because of the nature of the legislative process, EIS's for legislation must be prepared and reviewed according to the procedures followed in the development and review of the legislative matter. These procedures are described in Office of Management and Budget (OMB) Circular No. A-19.

(2) A working draft EIS shall be prepared by the EPA office responsible for preparing the legislative proposal or report on legislation. It shall be prepared concurrently with the development of the legislative proposal or report and shall contain the information required in § 6.304. The EIS shall be circulated for internal EPA review with the legislative proposal or report and other supporting documentation. The working draft EIS shall be modified to correspond with changes made in the proposal or report during the internal review. All major alternatives developed during the formulation and review of the proposal or report should be retained in the working draft EIS.

(i) The working draft EIS shall accompany the legislative proposal or report to OMB. EPA shall revise the working draft EIS to respond to comments from OMB and other Federal agencies.

(ii) Upon transmittal of the legislative proposal or report to Congress, the working draft EIS will be forwarded to CEQ and the Congress as a formal legislative EIS. Copies will be distributed according to procedures described in Appendix C.

(iii) Comments received by EPA on the legislative EIS shall be forwarded to the appropriate Congressional Committees. EPA also may respond to specific comments and forward its responses with the comments. Because legislation undergoes continuous changes in Congress beyond the control of EPA, no final EIS need be prepared by EPA.

§ 6.108 Completion of NEPA procedures before starting administrative action.

(a) No administrative action shall be taken until the environmental review process, resulting in an EIS or a negative declaration with environmental appraisal, has been completed.

(b) *When an EIS will be prepared.* Except when requested by the responsible official in writing and approved by CEQ, no administrative action shall be taken sooner than ninety (90) calendar days after a draft EIS has been distributed or sooner than thirty (30) calendar days after the final EIS has been made public. If the final text of an EIS is filed within ninety (90) days after a draft EIS has been circulated for comment, furnished to CEQ and made public, the minimum thirty (30) day period and the ninety (90) day period may run concurrently if they overlap. The minimum periods for review and advance availability of EIS's shall begin on the date CEQ publishes the notice of receipt of the EIS in the FEDERAL REGISTER. In addition, the proposed action should be modified to conform with any changes EPA considers necessary before the final EIS is published.

(c) *When an EIS will not be prepared.* If EPA decides not to prepare an EIS on any action listed in this part for which a negative declaration with environmental appraisal has been prepared, no administrative action shall be taken for at least fifteen (15) working days after the negative declaration is issued to allow public review of the decision. If significant environmental issues are raised during the review period, the decision may be changed and a new environmental appraisal or an EIS may be prepared.

§ 6.110 Responsibilities.

See Appendix B for responsibilities of this part.

Subpart B—Procedures

§ 6.200 Criteria for determining when to prepare an EIS.

The following general criteria shall be used when reviewing a proposed EPA action to determine if it will have a significant impact on the environment and therefore require an EIS:

(a) *Significant environmental effects.* (1) An action with both beneficial and detrimental effects should be classified as having significant effects on the environment, even if EPA believes that the net effect will be beneficial. However, preference should be given to preparing EIS's on proposed actions which, on balance, have adverse effects.

(2) When determining the significance of a proposed action's impacts, the responsible official shall consider both its short term and long term effects as well as its primary and secondary effects as defined in § 6.304(c). Particular attention should be given to changes in land use patterns; changes in energy supply and demand; increased development in floodplains; significant changes in ambient air and water quality or noise levels; potential violations of air quality, water quality and noise level standards; significant changes in surface or groundwater quality or quantity; and encroach-

ments on wetlands, coatstal zones, or fish and wildlife habitat, especially when threatened or endangered species may be affected.

(3) Minor actions which may set a precedent for future major actions with significant adverse impacts or a number of actions with individually insignificant but cumulatively significant adverse impacts shall be classified as having significant environmental impacts. If EPA is taking a number of minor, environmentally insignificant actions that are similar in execution and purpose, during a limited time span and in the same general geographic area, the cumulative environmental impact of all of these actions shall be evaluated.

(4) In determining the significance of a proposed action's impact, the unique characteristics of the project area should be carefully considered. For example, proximity to historic sites, parklands or wild and scenic rivers may make the impact significant. A project discharging into a drinking water aquifier may make the impact significant.

(5) A proposed EPA action which will have direct and significant adverse effects on a property listed in or eligible for listing in the National Register of Historic Places or will cause irreparable loss or destruction of significant scientific, prehistoric, historic or archaeological data shall be classified as having significant environmental impacts.

(b) *Controversial actions.* An EIS shall be prepared when the environmental impact of a proposed EPA action is likely to be highly controversial.

(c) *Additional criteria for specific programs.* Additional criteria for various EPA programs are in Subpart E (Title II Wastewater Treatment Works Construction Grants Program), Subpart F (Research and Development Programs), Subpart G (Solid Waste Management Programs) and Subpart H (Construction of Special Facilities and Facility Renovations).

§ 6.202 Environmental assessment.

Environmental assessments must be submitted to EPA by its grantees and contractors as required in Subparts E, F, G, and H of this part. The assessment is to ensure that the applicant considers the environmental impacts of the proposed action at the earliest possible point in his planning process. The assessment and other relevant information are used by EPA to decide if an EIS is required. While EPA is responsible for ensuring that EIS's are factual and comprehensive, it expects assessments and other data submitted by grantees and contractors to be accurate and complete. The responsible official may request additional data and analyses from grantees or other sources any time he determines they are needed to comply adequately with NEPA.

§ 6.204 Environmental review.

Proposed EPA actions, as well as ongoing EPA actions listed in § 6.106(c), shall be subjected to an environmental review. This review shall be a continuing one, starting at the earliest possible point in the development of the project. It shall consist of a study of the proposed action, including a review of any environmental assessments received, to identify and evaluate the environmental impacts of the proposed action and feasible alternatives. The review will determine whether significant impacts are anticipated from the proposed action, whether any feasible alternatives can be adopted or changes can be made in project design to eliminate significant adverse impacts, and whether an EIS or a negative declaration is required. The responsible official shall determine the proper scope of the environmental review. The responsible official may delay approval of related projects until the proposals can be reviewed together to allow EPA to properly evaluate their cumulative impacts.

§ 6.206 Notice of intent.

(a) *General.* (1) When an environmental review indicates a significant impact may occur and significant adverse impacts cannot be eliminated by making changes in the project, a notice of intent, announcing the preparation of a draft EIS, shall be issued by the responsible official. The notice shall briefly describe the EPA action, its location, and the issues involved (Exhibit 1).

(2) The purpose of a notice of intent is to involve other government agencies and interested persons as early as possible in the planning and evaluation of EPA actions which may have significant environmental impacts. This notice should encourage agency and public input to a draft EIS and assure that environmental values will be identified and weighed from the outset rather than accommodated by adjustments at the end of the decision-making process.

(b) *Specific actions.* The specific actions to be taken by the responsible official on notices of intent are:

(1) When the review process indicates a significant impact may occur and significant adverse impacts cannot be eliminated by making changes in the project, prepare a notice of intent immediately after the environmental review.

(2) Distribute copies of the notice of intent as required in Appendix C.

(3) Publish in a local newspaper, with adequate circulation to cover the area affected by the project, a brief public notice stating that an EIS will be prepared on a particular project, and the public may participate in preparing the EIS (Exhibit 2). News releases also may be submitted to other media.

(c) *Regional office assistance to program offices.* Regional offices will provide assistance to program offices in taking these specific actions when the EIS originates in a program office.

§ 6.208 Draft EIS's.

(a) *General.* (1) The responsible official shall assure that a draft EIS is prepared as soon as possible after the release of the notice of intent. Before releasing the draft EIS to CEQ, a preliminary version may be circulated for review to other offices within EPA with interest in or technical expertise related to the action. Then the draft EIS shall be sent to CEQ and circulated to Federal, State, regional and local agencies with special expertise or jurisdiction by law, and to interested persons. If the responsible official determines that a public hearing on the proposed action is warranted, the hearing will be held after the draft EIS is prepared, according to the requirements of § 6.402.

(2) Draft EIS's should be prepared at the earliest possible point in the project development. If the project involves a grant applicant or potential contractor, he must submit any data EPA requests for preparing the EIS. Where a plan or program has been developed by EPA or submitted to EPA for approval, the relationship between the plan and the later projects encompassed by its shall be evaluated to determine the best time to prepare an EIS. Whenever possible, an EIS will be drafted for the total program at the initial planning stage. Then later component projects included in the plan will not require individual EIS's unless they differ substantially from the plan, or unless the overall plan did not provide enough detail to fully assess significant impacts of individual projects. Plans shall be reevaluated by the responsible official to monitor the cumulative impact of the component projects and to preclude the plans' obsolescence.

(b) *Specific actions.* The specific actions to be taken by the responsible official on draft EIS's are:

(1) Distribute the draft EIS according to the procedures in Appendix C.

(2) Inform the agencies to reply directly to the originating EPA office. Commenting agencies shall have at least forty-five (45) calendar days to reply, starting from the date of publication in the FEDERAL REGISTER of lists of statements received by CEQ. If no comments are received during the reply period and no time extension has been requested, it shall be presumed that the agency has no comment to make. EPA may grant extensions of fifteen (15) or more calendar days. The time limits for review and extensions for State and local agencies; State, regional, and metropolitan clearinghouses; and interested persons shall be the same as those available to Federal agencies.

(3) Publish a notice in local newspapers stating that the draft EIS is available for comment and listing where copies may be obtained (Exhibit 2), and submit news releases to other media.

(4) Include in the draft EIS a notice stating that only those Federal, State, regional, and local agencies and interested persons who make substantive comments on the draft EIS or request a copy of the final EIS will be sent a copy.

(c) *Regional office assistance to program office.* If requested, regional offices will provide assistance to program offices in taking these specific actions when the EIS originates in a program office.

§ 6.210 Final EIS's.

(a) Final EIS's shall respond to all substantive comments raised through the review of the draft EIS. Special care should be taken to respond fully to comments disagreeing with EPA's position. (See also § 6.304(g).)

(b) Distribution and other specific actions are described in Appendix C. If there is an applicant, he shall be sent a copy. When the number of comments on the draft EIS is so large that distribution of the final EIS to all commenting entities appears impractical, the program or regional office preparing the EIS shall consult with OFA, which will consult with CEQ about alternative arrangements for distribution of the EIS.

§ 6.212 Negative declaration and environmental impact appraisals.

(a) *General.* When an environmental review indicates there will be no significant impact or significant adverse impacts have been eliminated by making changes in the project, the responsible official shall prepare a negative declaration to allow public review of his decision before it becomes final. The negative declaration and news release must state that interested persons disagreeing with the decision may submit comments for consideration by EPA. EPA shall not take administrative action on the project for at least fifteen (15) working days after release of the negative declaration and may allow more time for response. The responsible official shall have an environmental impact appraisal supporting the negative declaration available for public review when the negative declaration is released for those cases given in Subparts E, F, G, and H.

(b) *Specific actions.* The responsible official shall take the following specific actions on those projects for which both a negative declaration and an impact appraisal will be prepared:

(1) *Negative declaration.* (i) Prepare a negative declaration immediately after the environmental review. This document shall briefly summarize the purpose of the project, its location, the nature and extent of the land use changes related to the project, and the major primary and secondary impacts of the project. It shall describe how the more detailed environmental impact appraisal may be obtained at cost. (See Exhibit 3.)

(ii) Distribute the negative declaration according to procedures in Appendix C. In addition, submit to local newspapers and other appropriate media a brief news release with a negative declaration attached, informing the public that a decision not to prepare an EIS has been made and a negative declaration and environmental impact appraisal are available for public review and comment (Exhibit 2).

(2) *Environmental impact appraisal.* (i) Prepare an environmental impact appraisal concurrently with the negative declaration. This document shall briefly describe the proposed action and feasible alternatives, environmental impacts of the proposed action, unavoidable adverse impacts of the proposed action, the relationship between short term uses of man's environment and the maintenance and enhancement of long term productivity, steps to minimize harm to the environment, irreversible and irretrievable commitments of resources to implement the action, comments and consultations on the project, and reasons for concluding there will be no significant impacts. (See Exhibit 4.)

(ii) Distribute the environmental impact appraisal according to procedures in Appendix C.

§ 6.214 Additional procedures.

(a) *Historical and archaeological sites.* EPA is subject to the requirements of section 106 of the National Historic Preservation Act of 1966, 16 U.S.C. 470 *et seq.*, Executive Order 11593, the Archaeological and Historic Preservation Act of 1974, 16 U.S.C. 469 *et seq.*, and the regulations promulgated under this legislation. These statutes and regulations establish environmental review procedures which are independent of NEPA requirements.

(1) If an EPA action may affect properties with historic, architectural, archaeological or cultural value which are listed in the National Register of Historic Places (published in the FEDERAL REGISTER each February with supplements on the first Tuesday of each month), the responsible official shall comply with the procedures of the Advisory Council on Historic Preservation (36 CFR 800), including determining the need for a Memorandum of Agreement among EPA, the State Historic Preservation Officer and the Advisory Council. If a Memordandum of Agreement is executed, it shall be included in an EIS whenever one is prepared on a proposed action. See § 6.512(c) of this part for additional procedures for the construction grants program under Title II of the FWPCA, as amended.

(2) If an EPA action may cause irreparable loss or destruction of significant scientific, prehistoric, historic or archaeological data, the responsible official shall consult with the State Historic Preservation Officer in compliance with the Archaeological and Historic Preservation Act (P.L. 93-291).

(b) *Wetlands, floodplains, coastal zones, wild and scenic rivers, fish and wildlife.* The following procedures shall be applied to all EPA administrative actions covered by this part that may affect these environmentally sensitive resources.

(1) If an EPA action may affect wetlands, the responsible official shall consult with the appropriate offices of the Department of the Interior, Department of Commerce, and the U.S. Army Corps of Engineers during the environmental review to determine the probable impact of the action on the pertinent fish and wildlife resources and land use of these areas.

(2) If an EPA action may directly cause or induce the construction of buildings or other facilities in a floodplain, the responsible official shall evaluate flood hazards in connection with these facilities as required by Executive Order 11296 and shall, as far as practicable, consider alternatives to preclude the uneconomic, hazardous or unnecessary use of floodplains to minimize the exposure of facilities to potential flood damage, lessen the need for future Federal expenditures for flood protection and flood disaster relief and preserve the unique and significant public value of the floodplain as an environmental resource.

(3) If an EPA action may affect coastal zones or coastal waters as defined in Title III of the Costal Zone Management Act of 1972 (Pub. L. 92-583), the responsible official shall consult with the appropriate State offices and with the appropriate office of the Department of Commerce during the environmental review to determine the probable impact of the action on coastal zone or coastal water resources.

(4) If an EPA action may affect portions of rivers designated wild and scenic or being considered for this designation under the Wild and Scenic Rivers Act (Pub. L. 90-542), the responsible official shall consult with appropriate State offices and with the Secretary of the Interior or, where national forest lands are involved, with the Secretary of Agriculture during the environmental review to determine the status of an affected river and the probable impact of the action on eligible rivers.

(5) If an EPA action will result in the control or structural modification of any stream or other body of water for any purpose, including navigation and drainage, the responsible official shall consult with the United States Fish and Wildlife Service (Department of the Interior), the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration (Department of Commerce), the U.S. Army Corps of Engineers and the head of the agency administering the wildlife resources of the particular State in which the action will take place with a view to the conservation of wildlife resources. This consultation shall follow the procedures in the Fish and Wildlife Coordination Act (Pub. L. 85-624) and shall occur during the environmental review of an action.

(6) If an EPA action may affect threatened or endangered species defined under section 4 of the Endangered Species Act of 1973 (Pub. L. 93-205), the responsible official shall consult with the Secretary of the Interior or the Secretary of Commerce, according to the procedures in section 7 of that act.

(7) Requests for consultation and the results of consultation shall be documented in writing. In all cases where consultation has occurred, the agencies consulted should receive copies of either the notice of intent and EIS or the negative declaration and environmental appraisal prepared on the proposed action. If a decision has already been made to prepare an EIS on a project and wetlands, floodplains, coastal zones, wild

and scenic rivers, fish or wildlife may be affected, the required consultation may be deferred until the preparation of the draft EIS.

§ 6.216 Availability of documents.

(a) EPA will print copies of draft and final EIS's for agency and public distribution. A nominal fee may be charged for copies requested by the public.

(b) When EPA no longer has copies of an EIS to distribute, copies shall be made available for public inspection at regional and headquarters Offices of Public Affairs. Interested persons also should be advised of the availability (at cost) of the EIS from the Environmental Law Institute, 1356 Connecticut Avenue NW., Washington, D.C. 20036.

(c) Lists of EIS's prepared or under preparation and lists of negative declarations prepared will be available at both the regional and headquarters Offices of Public Affairs.

Subpart C—Content of Environmental Impact Statements

§ 6.300 Cover sheet.

The cover sheet shall indicate the type of EIS (draft or final), the official project name and number, the responsible EPA office, the date, and the signature of the responsible official. The format is shown in Exhibit 5.

§ 6.302 Summary sheet.

The summary sheet shall conform to the format in Exhibit 6, based on Appendix I of the August 1, 1973, CEQ Guidelines, or the latest revision of the CEQ Guidelines.

§ 6.304 Body of EIS.

The body of the EIS shall identify, develop, and analyze the pertinent issues discussed in the seven sections below; each section need not be a separate chapter. This analysis should include, but not be limited to, consideration of the impacts of the proposed project on the environmental areas listed in Appendix A which are relevant to the project. The EIS shall serve as a means for the responsible official and the public to assess the environmental impacts of a proposed EPA action, rather than as a justification for decisions already made. It shall be prepared using a systematic, interdisciplinary approach and shall incorporate all relevant analytical disciplines to provide meaningful and factual data, information, and analyses. The presentation of data should be clear and concise, yet include all facts necessary to permit independent evaluation and appraisal of the beneficial and adverse environmental effects of alternative actions. The amount of detail provided should be commensurate with the extent and expected impact of the action and the amount of information required at the particular level of decision making. To the extent possible, an EIS shall not be drafted in a style which requires extensive scientific or technical expertise to comprehend and evaluate the environmental impact of a proposed EPA action.

(a) *Background and description of the proposed action.* The EIS shall describe the recommended or proposed action, its purpose, where it is located and its time setting. When a decision has been made not to favor an alternative until public comments on a proposed action have been received, the draft EIS may treat all feasible alternatives at similar levels of detail; the final EIS should focus on the alternative the draft EIS and public comments indicate is the best. The relationship of the proposed action to other projects and proposals directly affected by or stemming from it shall be discussed, including not only other EPA activities, but also those of other governmental and private organizations. Land use patterns and population trends in the project area and the assumptions on which they are based also shall be included. Available maps, photos, and artists' sketches should be incorporated when they help depict the environmental setting.

(b) *Alternatives to the proposed action.* The EIS shall develop, describe, and objectively weigh feasible alternatives to any proposed action, including the options of taking no action or postponing action. The analysis should be detailed enough to show EPA's comparative evaluation of the environmental impacts, commitments of resources, costs, and risks of the proposed action and each feasible alternative. For projects involving construction, alternative sites must be analyzed in enough detail for reviewers independently to judge the relative desirability of each site. For alternatives involving regionalization, the effects of varying degrees of regionalization should be addressed. If a cost-benefit analysis is prepared, it should be appended to the EIS and referenced in the body of the EIS. In addition, the reasons why the proposed action is believed by EPA to be the best course of action shall be explained.

(c) *Environmental impacts of the proposed action.* (1) The positive and negative effects of the proposed action as it affects both the national and international environment should be assessed. The attention given to different environmental factors will vary according to the nature, scale, and location of proposed actions. Primary attention should be given to those factors most evidently affected by the proposed action. The factors shall include, where appropriate, the proposed action's effects on the resource base, including land, water quality and quantity, air quality, public services and energy supply. The EIS shall describe primary and secondary environmental impacts, both beneficial and adverse, anticipated from the action. The description shall include short term and long term impacts on both the natural and human environments.

(2) Primary impacts are those that can be attributed directly to the proposed action. If the action is a field experiment, materials introduced into the environment which might damage certain plant communities or wildlife species would be a primary impact. If the action involves construction of a facility, such as a sewage treatment works, an office building or a laboratory, the primary impacts of the action would include the environmental impacts related to construction and operation of the facility and land use changes at the facility site.

(3) Secondary impacts are indirect or induced changes. If the action involves construction of a facility, the secondary impacts would include the environmental impacts related to:

(i) induced changes in the pattern of land use, population density and related effects on air and water quality or other natural resources;

(ii) increased growth at a faster rate than planned for or above the total level planned by the existing community.

(4) A discussion of how socioeconomic activities and land use changes related to the proposed action conform or conflict with the goals and objectives of approved or proposed Federal, regional, State and local land use plans, policies and controls for the project area should be included in the EIS. If a conflict appears to be unresolved in the EIS, EPA should explain why it has decided to proceed without full reconciliation.

(d) *Adverse impacts which cannot be avoided should the proposal be implemented and steps to minimize harm to the environment.* The EIS shall describe the kinds and magnitudes of adverse impacts which cannot be reduced in severity or which can be reduced to an acceptable level but not eliminated. These may include water or air pollution, undesirable land use patterns, damage to fish and wildlife habitats, urban congestion, threats to human health or other consequences adverse to the environmental goals in section 101(b) of NEPA. Protective and mitigative measures to be taken as part of the proposed action shall be identified. These measures to reduce or compensate for any environmentally detrimental aspect of the proposed action may include those of EPA, its contractors and grantees and others involved in the action.

(e) *Relationship between local short term uses of man's environment and the maintenance and enhancement of long term productivity.* The EIS shall describe the extent to which the proposed action involves tradeoffs between short term environmental gains at the expense of long term gains or vice-versa and the extent to which the proposed action forecloses future options. Special attention shall be given to effects which narrow the range of future uses of land and water resources or pose long term risks to health or safety. Consideration should be given to windfall gains or significant decreases in current property values from implementing the proposed action. In addition, the reasons the proposed action is believed by EPA to be justified now, rather than reserving a long term option for other alternatives, including no action, shall be explained.

(f) *Irreversible and irretrievable commitments of resources to the proposed action should it be implemented.* The EIS shall describe the extent to which the proposed action requires commitment of construction materials, person-hours and funds to design and implement the project, as well as curtails the range of future uses of land and water resources. For example, induced growth in undeveloped areas may curtail alternative uses of that land. Also, irreversible environmental damage can result from equipment malfunctions or industrial accidents at the project site. Therefore, the need for any irretrievable and significant commitments of resources shall be explained fully.

(g) *Problems and objections raised by other Federal, State and local agencies and by interested persons in the review process.* Final EIS's (and draft EIS's if appropriate) shall summarize the comments and suggestions made by reviewing organizations and shall describe the disposition of issues raised, e.g., revisions to the proposed action to mitigate anticipated impacts or objections. In particular, the EIS shall address the major issues raised when the EPA position differs from most recommendations and explain the factors of overriding importance overruling the adoption of suggestions. Reviewer's statements should be set forth in a "comment" and discussed in a "response." In addition, the source of all comments should be clearly identified, and copies of the comments should be attached to the final EIS. Summaries of comments should be attached when a response has been exceptionally long or the same comments were received from many reviewers.

§ 6.306 Documentation.

All books, research reports, field study reports, correspondence and other documents which provided the data base for evaluating the proposed action and alternatives discussed in the EIS shall be used as references in the body of the EIS and shall be included in a bibliography attached to the EIS.

Subpart D—EPA Public Hearings on EIS's

§ 6.400 General.

While EPA is not required by statute to hold public hearings on EIS's, the responsible official should hold a public hearing on a draft EIS whenever a hearing may facilitate the resolution of conflicts or significant public controversy. This hearing may be in addition to public hearings held on facilities plans or section 209 plans. The responsible official may take special measures to involve interested persons through personal contact.

§ 6.402 Public hearing process.

(a) When public hearings are to be held, EPA shall inform the public of the hearing, for example, with a notice in the draft EIS. The notice should follow the summary sheet at the beginning of the EIS. The draft EIS shall be available for public review at least thirty (30) days before the public hearing. Public notice shall be given at least fifteen (15) working days before the public hearing and shall include:

(1) Publication of a public notice in a newspaper which covers the project area, identifying the project, announcing the date, time and place of the hearing and announcing the availability of detailed information on the proposed action for public inspection at one or more locations in the area in which the project will be located. "Detailed information" shall include a copy of the project application and the draft EIS.

(2) Notification of appropriate State and local agencies and appropriate State, regional and metropolitan clearinghouses.

(3) Notification of interested persons.

(b) A written record of the hearing shall be made. A stenographer may be used to record the hearing. As a minimum, the record shall contain a list of witnesses with the text of each presentation. A summary of the record, including the issues raised, conflicts resolved and unresolved, and any other significant portions of the record, shall be appended to the final EIS.

(c) When a public hearing has been held by another Federal, State, or local agency on an EPA action, additional hearings are not necessary. The responsible official shall decide if additional hearings are needed.

(d) When a program office is the originating office, the appropriate regional office will provide assistance to the originating office in holding any public hearing if assistance is requested.

Subpart E—Guidelines for Compliance With NEPA in the Title II Wastewater Treatment Works Construction Grants Program and the Areawide Waste Treatment Management Planning Program

§ 6.500 Purpose.

This subpart amplifies the general EPA policies and procedures described in Subparts A through D with detailed procedures for compliance with NEPA in the wastewater treatment works construction grants program and the areawide waste treatment management planning program.

§ 6.502 Definitions.

(a) "Step 1 grant." A grant for preparation of a facilities plan as described in 40 CFR 35.930–1.

(b) "Step 2 grant." A grant for preparation of construction drawings and specifications as described in 40 CFR 35.930–1.

(c) "Step 3 grant." A grant for fabrication and building of a publicly owned treatment works as described in 40 CFR 35.930–1.

§ 6.504 Applicability.

(a) *Administrative actions covered.* This subpart applies to the administrative actions listed below:

(1) Approval of all section 208 plans according to procedures in 40 CFR 35.1067–2;

(2) Approval of all facilities plans except those listed in paragraph (a)(5) of this section;

(3) Award of step 2 and step 3 grants, if an approved facilities plan was not required;

(4) Award of a step 2 or step 3 grant when either the project or its impact has changed significantly from that described in the approved facilities plan, except when the situation in paragraph (a)(5) of this section exists;

(5) Consultation during the NEPA review process. When there are overriding considerations of cost or impaired program effectiveness, the Regional Administrator may award a step 2 or a step 3 grant for a discrete segment of the project plans or construction before the NEPA review is completed if this project segment is noncontroversial. The remaining portion of the project shall be evaluated to determine if an EIS is required. In applying the criteria for this determination, the entire project shall be considered, including those parts permitted to proceed. In no case may these types of step 2 or step 3 grants be awarded unless both the Office of Federal Activities and CEQ have been consulted, a negative declaration has been issued on the segments permitted to proceed, and the grant award contains a specific agreement prohibiting action on the segment of planning or construction for which the NEPA review is not complete. Examples of consultation during the NEPA review process are: award of a step 2 grant for preparation of plans and specifications for a large treatment plant, when the only unresolved NEPA issue is where to locate the sludge disposal site; or award of a step 3 grant for site clearance for a large treatment plant, when the unresolved NEPA issue is whether sludge from the plant should be incinerated at the site or disposed of elsewhere by other means.

(b) *Administrative actions excluded.* The actions listed below are not subject to the requirements of this part:

(1) Approval of State priority lists;

(2) Award of a step 1 grant;

(3) Award of a section 208 planning grant;

(4) Award of a step 2 or step 3 grant when no significant changes in the facilities plan have occurred;

(5) Approval of issuing an invitation for bid or awarding a construction contract;

(6) Actual physical commencement of building or fabrication;

(7) Award of a section 206 grant for reimbursement;

(8) Award of grant increases whenever § 6.504(a)(4) does not apply;

(9) Awards of training assistance under FWPCA, as amended, section 109(b).

(c) *Retroactive application.* The new criteria in § 6.510 of this subpart do not apply to step 2 or step 3 grants awarded before July 1, 1975. However, the Regional Administrator may apply the new criteria of this subpart when he considers it appropriate. Any negative declarations issued before the effective date of this regulation shall remain in effect.

§ 6.506 Completion of NEPA procedures before start of administrative actions.

See § 6.108 and § 6.504.

§ 6.510 Criteria for preparation of environmental impact statements.

In addition to considering the criteria in § 6.200, the Regional Administrator shall assure that an EIS will be prepared on a treatment works facilities plan, 208 plan or other appropriate water quality management plan when:

(a) The treatment works or plan will induce significant changes (either absolute changes or increases in the rate of change) in industrial, commercial, agricultural, or residential land use concentrations or distributions. Factors that should be considered in determining if these changes are significant include but are not limited to: the vacant land subject to increased development pressure as a result of the treatment works; the increases in population which may be induced; the faster rate of change of population; changes in population density; the potential for overloading sewage treatment works; the extent to which landowners may benefit from the areas subject to increased development; the nature of land use regulations in the affected area and their potential effects on development; and deleterious changes in the availability or demand for energy.

(b) Any major part of the treatment works will be located on productive wetlands or will have significant adverse effects on wetlands, including secondary effects.

(c) Any major part of the treatment works will be located on or significantly affect the habitat of wildlife on the Department of Interior's threatened and endangered species lists.

(d) Implementation of the treatment works or plan may directly cause or induce changes that significantly:

(1) Displace population;

(2) Deface an existing residential area; or

(3) Adversely affect significant amounts of prime agricultural land or agricultural operations on this land.

(e) The treatment works or plan will have significant adverse effects on parklands, other public lands or areas of recognized scenic, recreational, archaeological or historic value.

(f) The works or plan may directly or through induced development have a significant adverse effect upon local ambient air quality, local ambient noise levels, surface or groundwater quantity or quality, fish, wildlife, and their natural habitats.

(g) The treated effluent is being discharged into a body of water where the present classification is too lenient or is being challenged as too low to protect present or recent uses, and the effluent will not be of sufficient quality to meet the requirements of these uses.

§ 6.512 Procedures for implementing NEPA.

(a) *Environmental assessment.* An adequate environmental assessment must be an integral, though identifiable, part of any facilities or section 208 plan submitted to EPA. (See § 6.202 for a general description.) The information in the facilities plan, particularly the environmental assessment, will provide the substance of an EIS and shall be submitted by the applicant. The analyses that constitute an adequate environmental assessment shall include:

(1) *Description of the existing environment without the project.* This shall include for the delineated planning area a description of the present environmental conditions relevant to the analysis of alternatives or determinations of the environmental impacts of the proposed action. The description shall include, but not be limited to, discussions of whichever areas are applicable to a particular study: surface and groundwater quality; water supply and use; general hydrology; air quality; noise levels, energy production and consumption; land use trends; population projections, wetlands, floodplains, coastal zones and other environmentally sensitive areas; historic and archaeological sites; other related Federal or State projects in the area; and plant and animal communities which may be affected, especially those containing threatened or endangered species.

(2) *Description of the future environment without the project.* The future environmental conditions with the no project alternative shall be forecast, covering the same areas listed in § 6.512 (a)(1).

(3) *Documentation.* Sources of information used to describe the existing environment and to assess future environmental impacts should be documented. These sources should include regional, State and Federal agencies with responsibility or interest in the types of impacts listed in § 6.512(a)(1). In particular, the following agencies should be consulted:

(i) Local and regional land use planning agencies for assessments of land use trends and population projections, especially those affecting size, timing, and location of facilities, and planning activities funded under section 701 of the Housing and Community Development Act of 1974 (Pub. L. 93-383);

(ii) The HUD Regional Office if a project involves a flood risk area identified under the Flood Disaster Protection Act of 1973 (Pub. L. 93-234);

(iii) The State coastal zone management agency, if a coastal zone is affected;

(iv) The Secretary of the Interior or Secretary of Agriculture, if a wild and scenic river is affected;

(v) The Secretary of the Interior or Secretary of Commerce, if a threatened or endangered species is affected;

(vi) The Fish and Wildlife Service (Department of Interior), the Department of Commerce, and the U.S. Army Corps of Engineers, if a wetland is affected.

(4) *Evaluation of alternatives.* This discussion shall include a comparative analysis of feasible options and a systematic development of wastewater treatment alternatives. The alternatives shall be screened with respect to capital and operating costs; significant primary and secondary environmental effects; physical, legal or institutional constraints; and whether or not they meet regulatory requirements. Special attention should be given to long term impacts, irreversible impacts and induced impacts such as development. The reasons for rejecting any alternatives shall be presented in addition to any significant environmental benefits precluded by rejection of an alternative. The analysis should consider, when relevant to the project:

(i) Flow and waste reduction measures, including infiltration/inflow reduction;

(ii) Alternative locations, capacities, and construction phasing of facilities;

(iii) Alternative waste management techniques, includign treatment and discharge, wastewater reuse and land application;

(iv) Alternative methods for disposal of sludge and other residual waste, including process options and final disposal options;

(v) Improving effluent quality through more efficient operation and maintenance;

(vi) For assessments associated with section 208 plans, the analysis of options shall include in addition:

(A) Land use and other regulatory controls, fiscal controls, non-point source controls, and institutional arrangements; and

(B) Land management practices.

(5) *Environmental impacts of the proposed action.* Primary and secondary impacts of the proposed action shall be described, giving special attention to unavoidable impacts, steps to mitigate adverse impacts, any irreversible or irretrievable commitments of resources to the project and the relationship between local short term uses of the environment and the maintenance and enhancement of long term productivity. See § 6.304 (c), (d), (e), and (f) for an explanation of these terms and examples. The significance of land use impacts shall be evaluated, based on current population of the planning area; design year population for the service area; percentage of the service area currently vacant; and plans for staging facilities. Special attention should be given to induced changes in population patterns and growth, particularly if a project involves some degree of regionalization. In addition to these items, the Regional Administrator may require that other analyses and data, which he determines are needed to comply with NEPA, be included with the facilities or section 208 plan. Such requirements should be discussed during preapplication conferences. The Regional Administrator also may require submission of supplementary information either before or after a step 2 grant or before a step 3 grant award if he determines it is needed for compliance with NEPA. Requests for supplementary information shall be made in writing.

(6) *Steps to minimize adverse effects.* This section shall describe structural and

nonstructural measures, if any, in the facilities plan to mitigate or eliminate significant adverse effects on the human and natural environments. Structural provisions include changes in facility design, size, and location; nonstructural provisions include staging facilities as well as developing and enforcing land use regulations and environmentally protective regulations.

(b) *Public hearing.* The applicant shall hold at least one public hearing before a facilities plan is adopted, unless waived by the Regional Administrator before completion of the facilities plan according to § 35.917-5 of the Title II construction grants regulations. Hearings should be held on section 208 plans. A copy of the environmental assessment should be available for public review before the hearing and at the hearing, since these hearings provide an opportunity to accept public input on the environmental issues associated with the facilities plan or the 208 water quality management strategy. In addition, a Regional Administrator may elect to hold an EPA hearing if environmental issues remain unresolved. EPA hearings shall be held according to procedures in § 6.402.

(c) *Environmental review.* An environmental review of a facilities plan or section 208 plan shall be conducted according to the procedures in § 6.204 and applying the criteria of § 6.510. If deficiencies exist in the environmental assessment, they shall be identified in writing by the Regional Administrator and must be corrected before the plan can be approved.

(d) *Additional procedures.* (1) Historic and archaeological sites. If a facilities or section 208 plan may affect properties with historic, architectural, archaeological or cultural value which are listed in or eligible for listing in the National Register of Historic Places or may cause irreparable loss or destruction of significant scientific, prehistoric, historic or archaeological data, the applicant shall follow the procedures in § 6.214(a).

(2) If the facilities or section 208 plan may affect wetlands, floodplains, coastal zones, wild and scenic rivers, fish or wildlife, the Regional Administrator shall follow the appropriate procedures described in § 6.214(b).

(e) *Notice of intent.* The notice of intent on a facilities plan or section 208 plan shall be issued according to § 6.206.

(f) *Scope of EIS.* It is the Regional Administrator's responsibility to determine the scope of the EIS. He should determine if an EIS should be prepared on a facilities plan(s) or section 208 plan and which environmental areas should be discussed in greatest detail in the EIS. Once an EIS has been prepared for the designated section 208 area, another need not be prepared unless the significant impacts of individual facilities or other plan elements were not adequately treated in the EIS. The Regional Administrator should document his decision not to prepare an EIS on individual facilities.

(g) *Negative declaration.* A negative declaration on a facilities plan or section 208 plan shall be prepared according to § 6.212. Once a negative declaration and environmental appraisal have been prepared for the facilities plan for a certain area, grant awards may proceed without preparation of additional negative declarations, unless the project has changed significantly from that described in the facilities plan.

§ 6.514 Content of environmental impact statements.

EIS's for treatment works or plans shall be prepared according to § 6.304.

Subpart F—Guidelines for Compliance With NEPA in Research and Development Programs and Activities

§ 6.600 Purpose.

This subpart amplifies the general EPA policies and procedures described in Subparts A through D by providing procedures for compliance with NEPA on actions undertaken by the Office of Research and Development (ORD).

§ 6.602 Definitions.

(a) "Work plan." A document which defines and schedules all projects required to fulfill the objectives of the program plan.

(b) "Program plan." An overall planning document for a major research area which describes one or more research objectives, including outputs and target completion dates, as well as person-year and dollar resources.

(c) "Appropriate program official." The official at each decision level within ORD to whom the Assistant Administrator delegates responsibility for NEPA compliance.

(d) "Exemption certification." A certified statement delineating those actions specifically exempted from NEPA compliance by existing legislation.

§ 6.604 Applicability.

The requirements of this subpart are applicable to administrative actions undertaken to approve program plans, work plans, and projects, except those plans and projects excluded by existing legislation. However, no administrative actions are excluded from the additonal procedures in § 6.214 of this part concerning historic sites, wetlands, coastal zones, wild and scenic rivers, floodplains or fish and wildlife.

§ 6.608 Criteria for determining when to prepare EIS's.

(a) An EIS shall be prepared by ORD when any of the criteria in § 6.200 apply or when:

(1) The action will have significant adverse impacts on public parks, wetlands, floodplains, coastal zones, wildlife habitats, or areas of recognized scenic or recreational value.

(2) The action will significantly deface an existing residential area.

(3) The action may directly or through induced development have a significant adverse effect upon local ambient air quality, local ambient noise levels, surface or groundwater quality; and fish, wildlife or their natural habitats.

(4) The treated effluent is being discharged into a body of water where the present classification is being challenged as too low to protect present or recent uses, and the effluent will not be of sufficient quality to meet the requirements of these uses.

(5) The project consists of field tests involving the introduction of significant quantities of: toxic or polluting agricultural chemicals, animal wastes, pesticides, radioactive materials, or other hazardous substances into the environment by ORD, its grantees or its contractors.

(6) The action may involve the introduction of species or subspecies not indigenous to an area.

(7) There is a high probability of an action ultimately being implemented on a large scale, and this implementation may result in significant environmental impacts.

(8) The project involves commitment to a new technology which is significant and may restrict future viable alternatives.

(b) An EIS will not usually be needed when:

(1) The project is conducted completely within a laboratory or other facility, and external environmental effects have been minimized by methods for disposal of laboratory wastes and safeguards to prevent hazardous materials entering the environment accidentally; or

(2) The project is a relatively small experiment or investigation that is part of a non-Federally funded activity of the private sector, and it makes no significant new or additional contribution to existing pollution.

§ 6.610 Procedures for compliance with NEPA.

EIS related activities for compliance with NEPA will be integrated into the decision levels of ORD's research planning system to assure managerial control. This control includes those administrative actions which do not come under the applicability of this subpart by assuring that they are made the subject of an exemption certification and filed with the Office of Public Affairs (OPA). ORD's internal procedures provide details for NEPA compliance.

(a) *Environmental assessment.* (1) Environmental assessments shall be submitted with all grant applications and all unsolicited contract proposals. The assessment shall contain the same information required for EIS's in § 6.304. Copies of § 6.304 (or more detailed guidance when available) and a notice of the requirement for assessment shall be included in all grant application kits and attached to letters concerning the submission of unsolicited proposals.

(2) In the case of competitive contracts, assessments need not be submitted by potential contractors since the NEPA procedures must be completed before a request for proposal (RFP) is issued. If there is a question concerning

the need for an assessment, the potential contractor should contact the official responsible for the contract.

(b) *Environmental review.* (1) At the start of the planning year, an environmental review will be performed for each program plan with its supporting substructures (work plans and projects) before incorporating them into the ORD program planning system, unless they are excluded from review by existing legislation. This review is an evaluation of the potentially adverse environmental effects of the efforts required by the program plan. The criteria in § 6.608 shall be used in conducting this review. Each program plan with its supporting substructures which does not have significant adverse impacts may be dismissed from further current year environmental considerations with a single negative declaration. Any supporting substructures of a program plan which cannot be dismissed with the parent plan shall be reviewed at the appropriate subordinate levels of the planning system for NEPA compliance.

(i) All continuing program plans and supporting substructures, including those previously dismissed from consideration, will be reevaluted annually for NEPA compliance. An environmental review will coincide with the annual planning cycle and whenever a major redirection of a parent plan is undertaken. All NEPA-associated documents will be updated as appropriate.

(ii) All approved program plans and supporting substructures, less budgetary data, will be filed in the OPA with a notice of intent or negative declaration and environmental appraisal.

(iii) Later plans and/or projects, added to fulfill the mission objectives but not identified at the time the program plans were approved, will be subjected to the same NEPA requirements for environmental assessments and/or reviews.

(iv) Those projects subjected to environmental assessments as outlined in paragraph (a) of this section and not exempt under existing legislation also shall undergo an environmental review before work begins.

(c) *Notice of intent and EIS.*

(1) If the reviews conducted according to paragraph (b) of this section reveal a potentially significant adverse effect on the environment and the adverse impact cannot be eliminated by replanning, the appropriate program official shall, after making sure the project is to be funded, issue a notice of intent according to § 6.206, and through proper organizational channels, shall request the Regional Administrator to assist him in the preparation and distribution of the EIS.

(2) As soon as possible after release of the notice of intent, the appropriate program official shall prepare a draft EIS using the criteria in Subpart B, § 6.208 and Subpart C. Through proper organizational channels, he shall request the Regional Administrator to assist him in the preparation and distribution of the draft EIS.

(3) The appropriate program official shall prepare final EIS's according to criteria in Subpart B, § 6.210 and Subpart C.

(4) All draft and final EIS's shall be sent through the proper organizational channels to the Assistant Administrator for ORD for approval. The approved statements then will be distributed according to the procedures in Appendix C.

(d) *Negative declaration and environmental impact appraisal.* If an environmental review conducted according to paragraph (b) of this section reveals that proposed actions will not have significant adverse environmental impacts, the appropriate program official shall prepare a negative declaration and environmental impact appraisal according to Subpart B, § 6.212. Upon assurance that the program will be funded, the appropriate program official shall distribute the negative declaration as described in § 6.212 and make copies of the negative declaration and appraisal available in the OPA.

(e) *Project start.* As required by § 6.108, a contract or grant shall not be awarded for an extramural project, nor for continuation of what was previously an intramural project, until at least fifteen (15) working days after a negative declaration has been issued or thirty (30) days after forwarding the final EIS to the Council on Environmental Quality.

Subpart G—Guidelines for Compliance With NEPA in Solid Waste Management Activities

§ 6.700 Purpose.

This subpart amplifies the general policies and procedures described in Subparts A through D by providing additional procedures for compliance with NEPA on actions undertaken by the Office of Solid Waste Management Programs (OSWMP).

§ 6.702 Criteria for the preparation of environmental assessments and EIS's.

(a) *Assessment preparation criteria.* An environmental assessment need not be submitted with all grant applications and contract proposals. Studies and investigations do not require assessments. The following sections describe when an assessment is or is not required for other actions:

(1) *Grants.* (i) *Demonstration projects.* Environmental assessments must be submitted with all applications for demonstration grants that will involve construction, land use (temporary or permanent), transport, sea disposal, any discharges into the air or water, or any other activity having any direct or indirect effects on the environment external to the facility in which the work will be conducted. Preapplication proposals for these grants will not require environmental assessments.

(ii) *Training.* Grant applications for training of personnel will not require assessments.

(iii) *Plans.* Grant applications for the development of comprehensive State, interstate, or local solid waste management plans will not require environmental assessments. A detailed analysis of environmental problems and effects should be part of the planning process, however.

(2) *Contracts.* (i) *Sole-source contract proposals.* Before a sole-source contract can be awarded, an environmental assessment must be submitted with a bid proposal for a contract which will involve construction, land use (temporary or permanent), sea disposal, any discharges into the air or water, or any other activity that will directly or indirectly affect the environment external to the facility in which the work will be performed.

(ii) *Competitive contract proposals.* Assessments generally will not be required on competitive contract proposals.

(b) *EIS preparation criteria.* The responsible official shall conduct an environmental review on those OSWMP projects on which an assesment is required or which may have effects on the environment external to the facility in which the work will be performed. The criteria in § 6.200 shall be utilized in determining whether an EIS need be prepared.

§ 6.704 Procedures for compliance with NEPA.

(a) *Environmental assessment.* (1) Environmental assessments shall be submitted to EPA according to procedures in § 6.702. If there is a question concerning the need for an assessment, the potential contractor or grantee should consult with the appropriate project officer for the grant or contract.

(2) The assessment shall contain the same sections specified for EIS's in § 6.304. Copies of § 6.304 (or more detailed guidance when available) and a notice alerting potential grantees and contractors of the assessment requirements in § 6.702 shall be included in all grant application kits, attached to letters concerning the submission of unsolicited proposals, and included with all RFP's.

(b) *Environmental review.* An environmental review will be conducted on all projects which require assessments or which will affect the environment external to the facility in which the work will be performed. This review must be conducted before a grant or contract award is made on an extramural project or before an intramural project begins. The guidelines in § 6.200 will be used to determine if the project will have any significant environmental effects. This review will include an evaluation of the assessment by both the responsible official and the appropriate Regional Administrator. The Regional Administrator's comments will include his recommendations on the need for an EIS. No detailed review or documentation is required on projects for which assessments are not required and which will not affect the environment external to a facility.

(c) *Notice of intent and EIS.* If any of the criteria in § 6.200 apply, the responsible official will assure that a notice of intent and a draft EIS are prepared. The responsible official may request the appropriate Regional Administrator to assist him in the distribution of the NEPA-associated documents. Distribution procedures are listed in Appendix C.

(d) *Negative declaration and environmental impact appraisal.* If the environmental review indicated no significant environmental impacts, the responsible official will assure that a negative declaration and environmental appraisal are prepared. These documents need not be prepared for projects not requiring an environmental review.

(e) The EIS process for the Office of Solid Waste Management Programs is shown graphically in Exhibit 7.

Subpart H—Guidelines for Compliance With NEPA in Construction of Special Purpose Facilities and Facility Renovations

§ 6.800 Purpose.

This subpart amplifies general EPA policies and procedures described in Subparts A through D by providing detailed procedures for the preparation of EIS's on construction and renovation of special purpose facilities.

§ 6.802 Definitions.

(a) "Special purpose facility." A building or space, including land incidental to its use, which is wholly or predominantly utilized for the special purpose of an agency and not generally suitable for other uses, as determined by the General Services Administration.

(b) "Program of requirements." A comprehensive document (booklet) describing program activities to be accomplished in the new special purpose facility or improvement. It includes architectural, mechanical, structural, and space requirements.

(c) "Scope of work." A document similar in content to the program of requirements but substantially abbreviated. It is usually prepared for small-scale projects.

§ 6.804 Applicability.

(a) *Actions covered.* These guidelines apply to all new special purpose facility construction, activities related to this construction (e.g., site acquisition and clearing), and any improvements or modifications to facilities having potential environmental effects external to the facility, including new construction and improvements undertaken and funded by the Facilities Management Branch, Facilities and Support Services Division, Office of Administration; by a regional office; or by a National Environmental Research Center.

(b) *Actions excluded.* This subpart does not apply to those activities of the Facilities Management Branch, Facilities and Support Services Division, for which the branch does not have full fiscal responsibility for the entire project. This includes pilot plant construction, land acquisition, site clearing and access road construction where the Facilities Management Branch's activity is only supporting a project financed by a program office. Responsibility for considering the environmental impacts of such projects rests with the office managing and funding the entire project. Other subparts of this regulation apply depending on the nature of the project.

§ 6.808 Criteria for the preparation of environmental assessments and EIS's.

(a) *Assessment preparation criteria.* The responsible official shall request an environmental assessment from a construction contractor or consulting architect/engineer employed by EPA if he is involved in the planning, construction or modification of special purpose facilities when his activities have potential environmental effects external to the facility. Such modifications include but are not limited to: facility additions, changes in central heating systems or wastewater treatment systems, and land clearing for access roads and parking lots.

(b) *EIS preparation criteria.* The responsible official shall conduct an environmental review of all actions involving construction of special purpose facilities and improvements to these facilities. The guidelines in § 6.200 shall be used to determine whether an EIS shall be prepared.

§ 6.810 Procedures for compliance with NEPA.

(a) *Environmental review and assessment.* (1) An environmental review shall be conducted when the program of requirements or scope of work has been completed for the construction, improvement, or modification of special purpose facilities. For special purpose facility construction, the Chief, Facilities Management Branch, shall request the assistance of the appropriate program office and Regional Administrator in the review. For modifications and improvements, the appropriate responsible official shall request assistance in making the review from other cognizant EPA offices.

(2) Any assessments requested shall contain the same sections listed for EIS's in § 6.304. Contractors and consultants shall be notified in contractual documents when an assessment must be prepared.

(b) *Notice of intent, EIS, and negative declaration.* The responsible official shall decide at the completion of the environmental review whether there may be any significant environmental impacts. If there could be significant environmental impacts, a notice of intent and an EIS shall be prepared according to the procedures in § 6.206. If there may not be any significant environmental impacts, a negative declaration and environmental impact appraisal shall be prepared according to the procedures in § 6.212.

(c) *Project start.* As required by § 6.108, a contract shall not be awarded or construction-related activities begun until at least fifteen (15) working days after release of a negative declaration, or until thirty (30) days after forwarding the final EIS to the Council on Environmental Quality.

EXHIBIT 1

NOTICE OF INTENT TRANSMITTAL MEMORANDUM SUGGESTED FORMAT

(Date)

ENVIRONMENTAL PROTECTION AGENCY

(Appropriate Office)

(Address, City, State, Zip Code)

To All Interested Government Agencies and Public Groups:

As required by guidelines for the preparation of environmental impact statements (EIS's), attached is a notice of intent to prepare an EIS for the proposed EPA action described below:

(Official Project Name and Number)

(City, State)

If your organization needs additional information or wishes to participate in the preparation of the draft EIS, please advise the (appropriate office, city, State).

Very truly yours,

(Appropriate EPA Official)

(List Federal, State, and local agencies to be solicited for comment.)

(List public action groups to be solicited for comment.)

NOTICE OF INTENT SUGGESTED FORMAT

NOTICE OF INTENT—ENVIRONMENTAL PROTECTION AGENCY

1. Project location:
   City ----------------------------------
   County ------------------------------
   State -----------------------------------
2. Proposed EPA action:

   ----
3. Issues involved:

   ----
4. Estimated project costs:
   Federal Share (total) ---------- $------
   Contract $---- Grant $---- Other $------
   Applicant share (if any):
   (Name) ---------------------$------
   Other (specify) ----------------$------
   Total ------------------------$------
5. Period covered by project:
   Start date: ---------------------------
   (Original date, if project covers more than one year)
   Dates of different project phases: --------
   Approximate end date: ----------------
6. Estimated application filing date: --------

EXHIBIT 2

PUBLIC NOTICE AND NEWS RELEASE SUGGESTED FORMAT

PUBLIC NOTICE

The Environmental Protection Agency (originating office) (will prepare, will not prepare, has prepared) a (draft, final) environmental impact statement on the following project:

(Official Project Name and Number)

(Purpose of Project)

(Project Location, City, County, State)

(Where EIS or negative declaration and environmental impact appraisal can be obtained)

This notice is to implement EPA's policy of encouraging public participation in the decision-making process on proposed EPA actions. Comments on this document may be submitted to (full address of originating office).

EXHIBIT 3

NEGATIVE DECLARATION SUGGESTED FORMAT

(Date)

ENVIRONMENTAL PROTECTION AGENCY

(Appropriate Office)

(Address, City, State, Zip Code)

To All Interested Government Agencies and Public Groups:

As required by guidelines for the preparation of environmental impact statements (EIS's), an environmental review has been performed on the proposed EPA action below:

(Official Project Name and Number)

(Potential Agency Financial Share)

(Project Location: City, County, State)

(Other Funds Included)

PROJECT DESCRIPTION, ORIGINATOR, AND PURPOSE

(Include a map of the project area and a brief narrative summarizing the growth the project will serve, the percent of vacant land the project will serve, major primary and secondary impacts of the project, and the purpose of the project.)

The review process did not indicate significant environmental impacts would result from the proposed action or significant adverse impacts have been eliminated by making changes in the project. Consequently, a preliminary decision not to prepare an EIS has been made.

This action is taken on the basis of a careful review of the engineering report, environmental impact assessment, and other supporting data, which are on file in the above office with the environmental impact appraisal and are available for public scrutiny upon request. Copies of the environmental impact appraisal will be sent at cost on your request.

Comments supporting or disagreeing with this decision may be submitted for consideration by EPA. After evaluating the comments received, the Agency will make a final decision; however, no administrative action will be taken on the project for at least fifteen (15) working days after release of the negative declaration.

Sincerely,

(Appropriate EPA Official)

EXHIBIT 4

ENVIRONMENTAL IMPACT APPRAISAL SUGGESTED FORMAT

A. Identify Project.

Name of Applicant:--------------------

Address: --------------------------

Project Number:--------------------

B. Summarize Assessment.

1. Brief description of project:--

2. Probable impact of the project on the environment: --

3. Any probable adverse environmental effects which cannot be avoided:--

4. Alternatives considered with evaluation of each:--

5. Relationship between local short-term uses of man's environment and maintenance and enhancement of long-term productivity: --

6. Steps to minimize harm to the environment: --

7. Any irreversible and irretrievable commitment of resources:--

8. Public objections to project, if any, and their resolution: --

9. Agencies consulted about the project: --

State representative's name:-----------

Local representative's name:-----------

Other: ---------------------------

C. Reasons for concluding there will be no significant impacts.

(Signature of appropriate official)

(Date)

EXHIBIT 5

COVER SHEET FORMAT FOR ENVIRONMENTAL IMPACT STATEMENTS

(Draft, Final)

ENVIRONMENTAL IMPACT STATEMENT

(Describe title of project plan and give identifying number)

Prepared by: --------------------------

(Responsible Agency Office)

Approved by: --------------------------

(Responsible Agency Official)

(Date)

EXHIBIT 6

SUMMARY SHEET FORMAT FOR ENVIRONMENTAL IMPACT STATEMENTS

(Check One)

( ) Draft

( ) Final

ENVIRONMENTAL PROTECTION AGENCY

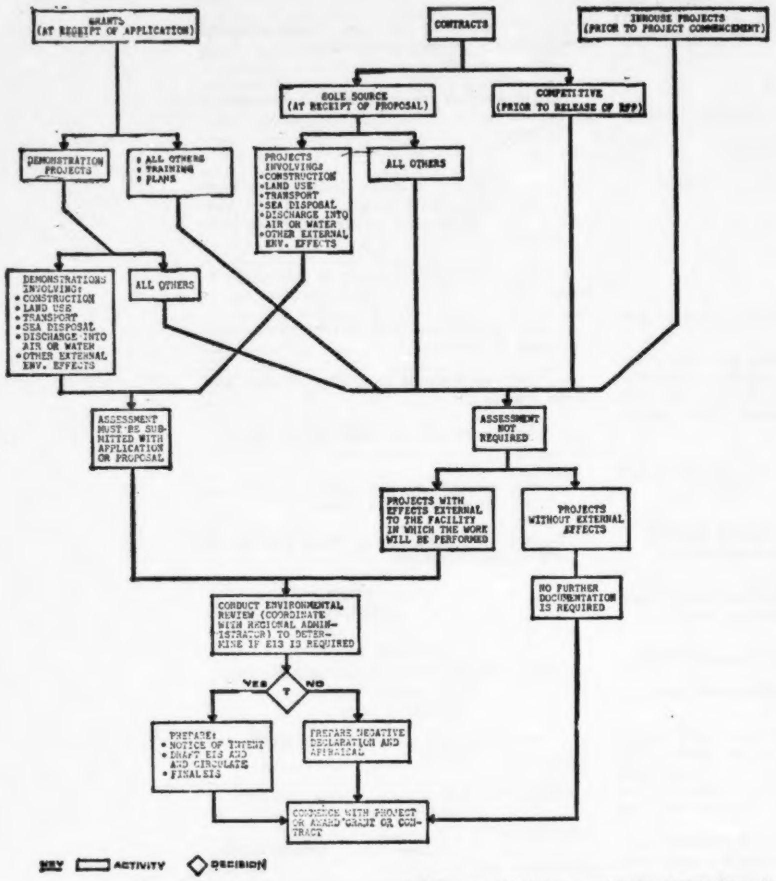
(Responsible Agency Office)

1. Name of action. (Check one)
   ( ) Administrative action.
   ( ) Legislative action.
2. Brief description of action indicating what States (and counties) are particularly affected.
3. Summary of environmental impact and adverse environmental effects.
4. List alternatives considered.
5. a. (for draft statements) List all Federal State, and local agencies and other comments have been requested.
   b. (for final statements) List all Federal Ctate, and local agencies and other sources from which written comments have been received.
6. Dates draft statement and final statement made available to Council on Environmental Quality and public.

Exhibit 7

FLOWCHART FOR OSWMP

PROCEDURES FOR DETERMINING IF AN EIS IS REQUIRED ON OSWMP PROJECTS


GRANTS (AT RECEIPT OF APPLICATION)
CONTRACTS
INHOUSE PROJECTS (PRIOR TO PROJECT COMMENCEMENT)
SOLE SOURCE (AT RECEIPT OF PROPOSAL)
COMPETITIVE (PRIOR TO RELEASE OF RFP)
DEMONSTRATION PROJECTS
• ALL OTHERS • TRAINING • PLANS
PROJECTS INVOLVING: •CONSTRUCTION •LAND USE •TRANSPORT •SEA DISPOSAL •DISCHARGE INTO AIR OR WATER •OTHER EXTERNAL ENV. EFFECTS
ALL OTHERS
DEMONSTRATIONS INVOLVING: • CONSTRUCTION • LAND USE • TRANSPORT • SEA DISPOSAL • DISCHARGE INTO AIR OR WATER • OTHER EXTERNAL ENV. EFFECTS
ALL OTHERS
ASSESSMENT MUST BE SUBMITTED WITH APPLICATION OR PROPOSAL
ASSESSMENT NOT REQUIRED
PROJECTS WITH EFFECTS EXTERNAL TO THE FACILITY IN WHICH THE WORK WILL BE PERFORMED
PROJECTS WITHOUT EXTERNAL AFFECTS
NO FURTHER DOCUMENTATION IS REQUIRED
CONDUCT ENVIRONMENTAL REVIEW (COORDINATE WITH REGIONAL ADMINISTRATOR) TO DETERMINE IF EIS IS REQUIRED
YES
?
NO
PREPARE: • NOTICE OF INTENT • DRAFT EIS AND AND CIRCULATE • FINAL EIS
PREPARE NEGATIVE DECLARATION AND APPRAISAL
COMMENCE WITH PROJECT OR AWARD GRANT OR CONTRACT
KEY
ACTIVITY
DECISION

APPENDIX A

CHECKLIST FOR ENVIRONMENTAL REVIEWS

Areas to be considered, when appropriate, during an environmental review include, but are not limited to, the items on this checklist, based on Appendix II of the CEQ guidelines for the preparation of environmental impact statements which appeared in the FEDERAL REGISTER August 1, 1973. The classification of items is not mandatory.

I. *Natural environment.* Consider the impacts of a proposed action on air quality, water supply and quality, soil conservation and hydrology, fish, and wildlife populations, fish and wildlife habitats, solid waste disposal, noise levels, radiation, and hazardous substances use and disposal.

II. *Land use planning and management.* Consider the impacts of a proposed action on energy supply and natural resources development; protection of environmentally critical areas, such as floodplains, wetlands, beaches and dunes, unstable soils, steep slopes and aquifer recharge areas, coastal area land use; and redevelopment and construction in built-up areas.

III. *Socioeconomic environment.* Consider the impacts of a proposed action on population density changes, congestion mitigation, neighborhood character and cohesion, low income populations, outdoor recreation, industrial/commercial/residential development and tax ratables, and historic, architectural and archaeological preservation.

APPENDIX B

RESPONSIBILITIES

I. *General responsibilities.* (a) *Responsible official.* (1) Requires contractors and grantees to submit environmental assessments and related documents needed to comply with NEPA, and assures environmental reviews are conducted on proposed EPA projects at the earliest possible point in EPA's decision-making process.

(2) When required, assures that draft EIS's are prepared and distributed at the earliest possible point in EPA's decision-making process, their internal and external review is coordinated, and final EIS's are prepared and distributed.

(3) When an EIS is not prepared, assures that negative declarations and environmental appraisals are prepared and distributed for those actions requiring them.

(4) Consults with appropriate officials identified in § 6.214 of this part.

(5) Consults with the Office of Federal Activities on actions involving unresolved conflicts with other Federal agencies.

(b) *Office of Federal Activities.* (1) Provides EPA with policy guidance and assures that EPA offices establish and maintain adequate administrative procedures to comply with this part.

(2) Monitors the overall timeliness and quality of the EPA effort to comply with this part.

(3) Provides assistance to responsible officials as required.

(4) Coordinates the training of personnel involved in the review and preparation of EIS's and other NEPA-associated documents.

(5) Acts as EPA liaison with the Council on Environmental Quality and other Federal and State entities on matters of EPA policy and administrative mechanisms to facilitate external review of EIS's, to determine lead agency and to improve the uniformity of the NEPA procedures of Federal agencies.

(6) Advises the Administrator and Deputy Administrator on projects which involve more than one EPA office, are controversial, are nationally significant, or "pioneer" EPA policy, when these projects have had or should have an EIS prepared on them.

(c) *Office of Public Inquiries.* Assists the Office of Federal Activities and responsible officials by answering the public's queries on the EIS process and on specific EIS's and by directing requests for copies of specific documents to the appropriate regional office or program.

(d) *Office of Public Affairs.* Analyzes the present procedures for public participation, and develops and recommends to the Office of Federal Activities a program to improve those procedures and increase public participation.

(e) *Regional Office Division of Public Affairs.* (1) Assists the responsible official or his designee on matters pertaining to negative declarations, notices of intent, press releases, and other public notification procedures.

(2) Assists the responsible official or his designee by answering the public's queries on the EIS process and on specific EIS's, and by filling requests for copies of specific documents.

(f) *Offices of the Assistant Administrators and Regional Administrators.* (1) Provides specific policy guidance to their respective offices and assures that those offices establish and maintain adequate administrative procedures to comply with this part.

(2) Monitors the overall timeliness and quality of their respective office's efforts to comply with this part.

(3) Acts as liaison between their offices and the Office of Federal Activities and between their offices and other Assistant Administrators or Regional Administrators on matters of agencywide policy and procedures.

(4) Advises the Administrator and Deputy Administrator through the Office of Federal Activities on projects or activities within their respective areas of responsibilities which involve more than one EPA office, are controversial, are nationally significant, or "pioneer" EPA policy, when these projects have had or should have an EIS prepared on them.

(g) *The Office of Legislation.* (1) Provides the necessary liaison with Congress.

(2) Coordinates the preparation of EIS's required on reports on legislation originating outside EPA. (See § 6.106(d)).

(h) *The Office of Planning and Evaluation.* Coordinates the preparation of EIS's required on EPA legislative proposals. (See § 6.106 (d)).

II. *Responsibilities for Title II Construction Grants Program (Subpart E).* (a) *Responsible official.* The responsible official for EPA actions covered by this subpart is the Regional Administrator. The responsibilities of the Regional Administrator in addition to those in Appendix B.I, are to:

(1) Assist the Office of Federal Activities in coordinating the training of personnel involved in the review and preparation of NEPA-associated documents.

(2) Require grant applicants and those who have submitted plans for approval to provide the information the regional office requires to comply with these guidelines.

(3) Consult with the Office of Federal Activities concerning works or plans which significantly affect more than one regional office, are controversial, are of national significance or "pioneer" EPA policy, when these works have had or should have had an EIS prepared on them.

(b) *Assistant Administrator*. The responsibilities of the Office of the Assistant Administrator, as described in Appendix B.I, shall be assumed by the Assistant Administrator for Water and Hazardous Materials for EPA actions covered by this subpart.

(c) Oil and Special Materials Control Division, Office of Water Program Operations, coordinates all activities and responsibilities of the Office of Water Program Operations concerned with preparation and review of EIS's. This includes providing technical assistance to the Regional Administrators on EIS's and assisting the Office of Federal Activities in coordinating the training of personnel involved in the review and preparation of NEPA-associated documents.

(d) *Public Affairs Division, Regional Offices*. The responsibilities of the regions' Public Affairs Divisions, in addition to those in Appendix B.I, are to:

(1) Assist the Regional Administrator in the preparation and dissemination of NEPA-associated documents.

(2) Collaborate with the Headquarters Office of Public Affairs to analyze procedures in the regions for public participation and to develop and recommend to the Office of Federal Activities a program to improve those procedures.

III. *Responsibilities for Research and Development Programs (Subpart F)*. The Assistant Administrator for Research and Development, in addition to those responsibilities outlined in Appendix B.I(a), will also assume the responsibilities described in Appendix B.I(f).

IV. *Responsibilities for Solid Waste Management Programs (Subpart G)*. (a) *Responsible Official*. The responsible official for EPA actions covered by this subpart is the Deputy Assistant Administrator for Solid Waste Management Programs. The responsibilities of this official, in addition to those in Appendix B.I(a), are to:

(1) Assist the Office of Federal Activities in coordinating the training of personnel involved in the review and preparation of all NEPA-associated documents.

(2) Advise the Assistant Administrator for Air and Waste Management concerning projects which significantly affect more than one regional office, are controversial, are nationally significant, or "pioneer" EPA policy.

V. *Responsibilities for Special Purpose Facilities and Facility Renovation Programs (Subpart H)*.

(a) *Responsible official*. The responsible official for new construction and modification of special purpose facilities is as follows:

(1) The Chief, Facilities Management Branch, Data and Support Systems Division, shall be the responsible official on all new construction of special purpose facilities and on all improvement and modification projects for which the Facilities Management Branch has received a funding allowance.

(2) The Regional Administrator shall be the responsible official on all improvement and modification projects for which the regional office has received the funding allowance.

(3) The Center Directors shall be the responsible officials on all improvement and modification projects for which the National Environmental Research Centers have received the funding allowance.

(b) The responsibilities of the responsible officials, in addition to those in Appendix B.I, are to:

(1) Ensure that environmental assessments are submitted when requested, that environmental reviews are conducted on all projects, and EIS's are prepared and circulated when there will be significant impacts.

(2) Assist the Office of Federal Activities in coordinating the training of personnel involved in the review and preparation of NEPA-associated documents.

APPENDIX C

DISTRIBUTION AND AVAILABILITY OF DOCUMENTS

I. *Negative Declaration*. (a) The responsible official shall distribute two copies of each negative declaration to:

(1) The appropriate Federal, State and local agencies and to the appropriate State and areawide clearinghouses.

(2) The Office of Legislation, the Office of Public Affairs and the Office of Federal Activities.

(3) The headquarters EIS coordinator for the program office originating the document. When the originating office is a regional office and the action is related to water quality management, one copy should be forwarded to the Oil and Special Materials Control Division, Office of Water Program Operations.

(b) The responsible official shall distribute one copy of each negative declaration to:

(1) Local newspapers and other local mass media.

(2) *Interested persons on request*. If it is not practical to send copies to all interested persons, make the document available through local libraries or post offices, and notify individuals that this action has been taken.

(c) The responsible official shall have a copy of the negative declaration and any documents supporting the negative declaration available for public review at the originating office.

II. *Environmental Impact Appraisal*. (a) The responsible official shall have the environmental impact appraisal available when the negative declaration is distributed and shall forward one copy to the headquarters EIS coordinator for the program office originating the document and to any other Federal or State agency which requests a copy.

(b) The responsible official shall have a copy of the environmental impact appraisal available for public review at the originating office and shall provide copies at cost to persons who request them.

III. *Notice of Intent*. (a) The responsible official shall forward one copy of the notice of intent to:

(1) The appropriate Federal, State and local agencies and to the appropriate State, regional and metropolitan clearing houses.

(2) Potentially interested persons.

(3) The Offices of Federal Activities, Public Affairs and Legislation.

(4) The headquarters Grants Administration Division, Grants Information Branch.

(5) The headquarters EIS coordinator for the program office originating the notice. When the originating office is a regional office and the action is related to water quality management, one copy should be forwarded to the Oil and Special Materials Control Division, Office of Water Program Operations.

IV. *Draft EIS's*. (a) The responsible official shall send two copies of the draft EIS to:

(1) The Office of Federal Activities.

(2) The headquarters EIS coordinator for the program office originating the document. When the originating office is a regional office and the project is related to water quality management, send two copies to the Oil and Special Materials Control Division, Office of Water Program Operations.

(b) If none of the above offices requests any changes within ten (10) working days after notification, the responsible official shall:

(1) Send five copies of the draft EIS to CEQ.

(2) Send two copies of the draft EIS to the Office of Public Affairs and to the Office of Legislation.

(3) Send two copies of the draft EIS to the appropriate offices of reviewing Federal agencies that have special expertise or jurisdiction by law with respect to any impacts involved. CEQ's guidelines (40 CFR 1500.9 and Appendices II and III) list those agencies to which draft EIS's will be sent for official review and comment.

(4) Send two copies of the draft EIS to the appropriate Federal, State, regional and metropolitan clearinghouses.

(5) Send one copy of the draft EIS to public libraries in the project area and interested persons. Post offices, city halls or courthouses may be used as distribution points if public library facilities are not available.

(c) The responsible official shall make a copy of the draft EIS available for public review at the originating office and at the Office of Public Affairs.

V. *Final EIS*. (a) The responsible official shall distribute the final EIS to the following offices, agencies and interested persons:

(1) Five copies to CEQ.

(2) Two copies to the Office of Public Affairs, Legislation and Federal Activities.

(3) Two copies to the headquarters EIS coordinator for the program office originating the document.

(4) One copy to Federal, State and local agencies and interested persons who made substantive comments on the draft EIS or requested a copy of the final EIS.

(5) One copy to a grant applicant.

(b) The responsible official shall make a copy of the final EIS available for public review at the originating office and at the Office of Public Affairs.

VI. *Legislative EIS*. Copies of the legislative EIS shall be distributed by the responsible official according to the procedures in section IV(b) of this appendix. In addition, the responsible official shall send two copies of the EIS to the Office of Federal Activities and the EIS coordinator of the originating office.

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Appendix K

AIR QUALITY MITIGATION MEASURES ADOPTED FOR THE ENCINA JOINT POWERS AGENCY PROJECT

Air
let's keep it Clean.
THE SAN DIEGO AIR QUALITY PROGRAM
A regional cooperative effort of the County of San Diego,
Cities of the San Diego Region, Comprehensive Planning Organization,
and Air Pollution Control District.

POLICY ADVISORY COMMITTEE
COMMUNITY RESOURCE PANEL
PROGRAM COORDINATION GROUP

June 13, 1977

IMPLEMENTATION PROGRAM
FOR THE
REGIONAL AIR QUALITY STRATEGY

TACTICS WITH LOCAL
RESPONSIBILITY

☐ Comprehensive Planning Organization—Suite 524 Security Pacific Plaza—1200 Third Avenue—San Diego, CA 92101 (714) 233-5211
☐ Air Pollution Control District—9150 Chesapeake Drive—San Diego. CA 92123 (714) 565-5901

5/18/77

TACTIC P1 - Dry Cleaners

Description: Reduction of petroleum solvent emissions from 21 dry cleaners.

Lead Agency: APCD

Performance Expectations: 50% reduction by 1980 (1.7 tons).

Potential: The control methods under consideration by the Dry Cleaners Task Force are improved clothes handling, tightening of systems to prevent leaks, improved solvent filters, and carbon absorption or incineration of dryer exhaust.

It will be costly to achieve the 50% reduction. The large cleaners and possibly the middle sized ones will have to put in activated carbon or incinerators. Whether the cost is beyond reason is yet to be determined by the Task Force.

Implementation Program and Schedule:

August 1, 1977	Report and recommendtion due from Dry Cleaners Task Force.
August 17, 1977	Preliminary review by Community Resource Panel; referred to Stationary Source Committee.
September 1, 1977	Completion of APCD staff comments and separate recommendations, if any.
September 21, 1977	Final review and comment by the Community Resource Panel.
September 28, 1977	File Board letter requesting public hearing.
October 12, 1977	Air Pollution Control Board sets public hearing.
November 30, 1977	Public hearing to adopt new rule.
December 30, 1977	Second public hearing, if required.

Some of the control methods should take only a few months to implement. Others will take a year or more. No implementation schedules can be projected until the task force completes its work.

The ORGSOL Committee is beginning some work on dry cleaners. We do not expect to wait for the ORGSOL Committee unless its work is significantly accelerated.

Status: Task Force is meeting weekly gathering basic data.

Tactic P2 - Surface Cleaning

Description: This tactic covers general industrial and commercial cold cleaning processes used by automotive shops, general mechanical shops, maintenance shops, the electronics manufacturing industry, the fiberglass industry, medical institutions, etc.

Lead Agency: ARB/APCD

Performance Expectations: The RAQS calls for a 30% reduction. This would be 11.7 RHC tons per day in 1980 and 13.2 tons in 1985.

Potential: This tactic was developed with some uncertainty, and that uncertainty remains. There may be no alternatives to many of the solvents used, and control equipment is inappropriate in many cases.

Implementation Program and Schedule: The ORGSOL Committee will probably defer work in this area until industrial coatings are completed. Thus a model regulation may be one to two years away. APCD may be able to begin work on this tactic before ORGSOL, but this is another tactic which needs statewide regulation (see discussion in tactics P3 and P4).

The APCD will hold hearings to adopt regulations within six months after the ARB adopts guidelines.

Status: No ORGSOL or APCD activity at this time.

5/18/77

TACTICS P3, P4 - Architectural and Industrial Coatings

Description: Tactic P3 control solvent content of architectural coatings: primers and paints for building interiors and exteriors, bridges, and stripes on streets and parking lots. Marine applications are included but action on them is deferred. Tactic P4 controls solvent content of industrial coatings on cars, furniture, appliances, shelving, cabinets, machinery, etc.

Lead Agency: ARB/APCD

Performance Expectations: The RAQS calls for a 30% reduction in solvents by 1980, 60% by 1985 and 90% by 1990 (both tactics).

Potential: The 30% and 60% reductions appear achievable but not necessarily in the time frame proposed. There are problem applications in architectural coatings (for example, stains; and paints for bridges and ships). It appears necessary to defer control of these problem areas a number of years, viz., beyond 1980. Work on industrial coatings is slow to start (see below). We do not know that 90% can be achieved in either category; 70% or 80% may be achievable, over a lengthy period of time.

Implementation Program and Schedule: Controlling paints must be a statewide action; San Diego does not have the leverage necessary to cause the development of new coatings technology. To this end, the State Air Resources Board has established an Organic Solvent (ORGSOL) Committee, composed of ARB, San Diego, Bay Area and Southern California personnel. This task force has about completed work on architectural coatings. An ORGSOL regulation should be proposed to the ARB in late June. After that there is a 5-6 month local review and hearing process to be completed before a regulation can be adopted (the details of this review and hearing process are set out in the P1 tactic). Based on information now at hand, adoption of ORGSOL regulations appears as follows:

	ARB	APCD
Architectural Coatings	June, 1977	December, 1977
Auto Refinishing	November, 1977	May, 1978

It must be understood that APCD regulations are entirely dependent on the ORGSOL Committee and ARB action on guideline regulations. Thus San Diego has no control over when it begins the review and hearing process.

ORGSOL work has commenced on a number of industrial coatings. We project auto refinishing as being the first industrial coating because we are doing the ORGSOL work. We are ahead of all other such efforts by the Committee. Other industrial coatings should follow in due course, but it is impossible to estimate completion time. It is also too early to predict the date and degree of control.

Status: See above.

5/18/77

TACTIC P7 - Vapor Recovery

Description: Increase gasoline vapor recovery from the present 90% to 95% by 1985.

Lead Agency: ARB/APCD

Performance Expectation: Attachment 3 to the Regional Air Quality Strategy relies on reliability improvements and standardized vehicle fill pipe configuration to give 95% with little or no change in the regulatory program.

Potential: As much as 98% is achievable. The new "3rd generation" secondary vapor recovery systems have achieved 95% on existing vehicles, and are extremely reliable. Standardized fill pipes should increase this recovery in the years to come. However, it is doubtful that this potential can be realized if balance systems are certified. So far balance systems have failed ARB certification tests, but the oil industry is still trying. Approximately .8 tons/day RHC would be the incremental difference between 98% and 95% vapor recovery (1.6 tons/day if bulk plants are included). To achieve the 97-98% reduction a new APCD regulation for 95% vapor recovery is needed.

Implementation Program and Schedule: The ARB vehicle fill pipe regulation is adopted.

The APCD has yet to achieve 90% reduction. With recent rule changes, and ARB certification of systems in the next few weeks, 90% can be achieved in about two years. If either the ARB or San Diego APCD does not approve the balance system, a new round of litigation could ensue, resulting in additional delay. Increasing the requirement from 90% to 95% could be done at any time, but probably should be done now. This would not necessarily delay vapor recovery further, but it could.

Status: See above.

5/18/77

TACTIC M1 - Vehicle Inspection and Maintenance

Description: Inspection and Maintenance of on-road motor vehicles to give 7% reduction in RHC emissions for trucks, motorcycles, Mexican vehicles and pre-1975 model light duty vehicles, and to maintain 1975 and later light duty vehicles at standard. (Light duty vehicles are cars and light pick-ups.)

Lead Agency: ARB

Performance Expectations:

Source	1980	1985	1990	1995	2000
Passenger Rehicle Exhaust	4%	1%	1%	0%	0%
Light Duty Truck Exhaust	4%	2%	1%	0%	0%
Heavy Duty Trucks, Street Motorcycles, and Mexican Vehicles	7%	7%	7%	7%	7%
RHC Reduction - Tons/Day	3.5	2.2	1.9	1.9	2.1

Potential: The RAQS assumes in its emissions forecasts that 1975 and later model light duty vehicles will be meeting new vehicle certification standards. It also assumes that inspection and maintenance will not achieve reductions below the forecast, but will be necessary to achieve the forecast. It is clear now that:

1. the assumption that 1975 and later model light duty vehicles in use will not be achieving the new vehicle standards;
2. a strong inspection and maintenance program can be very effective (better than 7%, perhaps as much as 15%); and
3. the Air Quality Maintenance Plan must use realistic forecasts and this tactic must be improved to get more than 7% reduction from light duty vehicles.
4. Seven percent or greater reductions can be achieved for the other classes of vehicles, but implementation is many years away. It is probably unrealistic to expect Mexican vehicles to be included in the program.

Implementation Program and Schedule: The ARB has no formal plans for inspection and maintenance in San Diego. The state has plans for only light duty vehicles only in the South Coast Air Basin, and those plans will not achieve a 7% reduction. ARB staff projects that if the South Coast program suffers no more delays (it is already 3-4 years behind the original legislative schedule), the State will bring its program to San Diego in the mid 1980s. Congressional changes in the Clean Air Act should cause a change for the better in the state program.

TACTIC M1

5/18/77

The Community Resource Panel has proposed and the Policy Advisory Committee has approved a different program, to be implemented in San Diego only. It would require a minimum emissions checkout of all vehicles once a year. It has potential for a 15% emissions reduction. It is not designed for heavy duty vehicles, motorcycles, or vehicles based outside the county (Mexican vehicles), but could easily be expanded to include trucks and motorcycles at a later time.

The projected schedule is as follows:

May 16, 1977	Begin effort to obtain political industry, ARB and EPA support.
July 1, 1977	Obtain introduction of enabling legislation.
Sept. 1, 1978	Obtain passage of enabling legislation, effective January 1, 1979.
Jan. 1, 1979	Begin implementation.

Status: See above.

TACTIC T1 (MODIFIED)
PROCESS FOR COORDINATED LAND USE AND TRANSPORTATION ACTIONS

TACTIC DESCRIPTION

This process proposes to achieve air quality improvements through coordinated land use and transportation actions by local general purpose governments, the Comprehensive Planning Organization (CPO), transit authorities, and the Unified Port District. At the present time, there exists in the San Diego Region a Regional Comprehensive Plan (RCP) including a Regional Transportation Plan (RTP) adopted by CPO. There also exists a set of general plans which have been adopted by general purpose local governments. There are incompatibilities which exist between the population forecasts upon which these plans are based, which interfere with the attainment and maintenance of air quality standards.

This proposed process recognizes the validity of both local general plans and the RCP as officially adopted land use and transportation policy in San Diego. This proposed process envisions modifications to both general plans and the RCP so as to achieve consistency of purpose and achieve air quality benefits.

LEAD AGENCY: CPO, Member Jurisdictions

PERFORMANCE EXPECTATION

The objective of this tactic is specific reductions in VMT, trip, and vehicle populations for light duty passenger vehicles and trucks, street motorcycles, and Mexican driver vehicles beginning in 1980. The reductions shown below are for Tactic T1 and should be considered an estimate of the reductions from the modified tactic.

TACTIC T1 RHC EMISSION REDUCTION

Source	1980	1985	1990	1995	2000
Light Duty Passenger and Truck VMT	9.3%	12.1%	12.8%	13.4%	12.8%
Light Duty Passenger and Truck Trips	2.2%	2.6%	2.3%	2.5%	3.0%
Light Duty Passenger Population	1.2%	1.0%	0.9%	0.8%	0.8%
Light Duty Truck Population	0.2%	0.2%	0.2%	0.2%	0.2%
Street Motorcycle VMT	8.9%	11.6%	12.3%	13.1%	12.9%
Mexican Driver VMT	8.7%	11.7%	12.7%	13.5%	12.8%
Mexican Driver Trips	7.2%	5.4%	6.0%	6.0%	5.7%
RHC Reduction - Tons/Day	3.8	3.5	3.1	3.3	3.9

IMPLEMENTATION PROGRAM AND SCHEDULE

Date		
Done	A.	CPO and member jurisdictions review and agree upon major transportation and land use assumptions about future regional development.
May 1977	B.	Run Urban Development Model and transportation models to produce new population, land use, and transportation forecasts.
July-Nov 1977	C.	Local agencies review and adopt the forecasts.
Nov. 1977	D.	CPO reviews and adopts the forecasts.
Oct. 1977	E.	Prepare detailed proposal for implementation, including, if necessary, an override vote procedure for local jurisdictions. Ascertain if change to state law is necessary for the procedure.
Oct. 1977	F.	Formulate an air quality impact assessment methodology for analyzing proposed changes to general plans or the RCP. Integrate this methodology with the proposal prepared in Item "E" to provide mitigating measures for environmental impact reports done for general plans, community plans and development projects.
Continuing	G.	Revise local general plans and/or Regional Comprehensive Plan (RCP) to achieve reconciliation.
Nov. 1977	H.	Establish means to monitor tactic effectiveness.

TACTIC T2
MAXIMUM CARPOOLS AND VANPOOLS WITH INCENTIVES

TACTIC DESCRIPTION

Tactic T2 proposes the implementation of a large carpool, vanpool, and subscription bus program to be effective by 1980. To achieve the VMT and trip reduction objective will require the formation of about 41,400 new carpools and 1,090 new vanpools (or an equivalent combination of carpools, vanpools, and subscription buses).

LEAD AGENCY: CPO, CALTRANS, Member Jurisdictions

PERFORMANCE EXPECTATION

The objective of this tactic is 7% VMT and 5% trip reduction for light duty passenger vehicles and trucks beginning in 1980.

TACTIC T2 RHC EMISSION REDUCTION

Source	1980	1985	1990	1995	2000
Light Duty Passenger and Truck VMT	7.0%	7.0%	7.0%	7.0%	7.0%
Light Duty Passenger and Truck Trips	5.0%	5.0%	5.0%	5.0%	5.0%
RHC Reduction - Tons/Day	3.1	2.0	1.6	1.5	1.7

IMPLEMENTATION PROGRAM AND SCHEDULE

I. EARLY ACTIONS

Date

A. GOVERNMENT AGENCIES. Obtain positive commitment and support from elected officials and employers for the region's ridesharing program "Commuter Computer".

July 1977 — 1. Prepare a model ridesharing program for adoption by local jurisdictions.

Sept. 1977 — 2. Present the ridesharing program for adoption by all local jurisdictions and school districts for their employees. The program would contain components such as the following:

- Appointment of a "Ridesharing Coordinator" to work with Commuter Computer.

- Provision of incentives such as preferred parking and parking fees for carpools.
- "Ridesharing Coordinator" to investigate "Reimbursed Ridesharing" with city/county vehicles similar to CALTRANS program.
- Feedback to CPO on number of carpools formed and other information.

Oct. 1977 — 3. Present the ridesharing program for adoption by state and federal employers.

Oct. 1977 & Continuing — 4. Work with mayors/councilmen/supervisors, and chambers of commerce to promote the ridesharing program to large and small employers in their areas.

Oct. 1977 — 5. Present the ridesharing program for adoption by the U. S. Navy, including the coordination of ridesharing activities for all San Diego military installations through a single office.

Continuing — 6. CPO staff will provide quarterly carpooling activity reports to the CPO Board to inform the Board of ongoing activities and determine those areas needing stronger support.

Summer 1977 — B. APCD EMERGENCY PLAN. Use the proposed APCD Air Pollution Emergency Plan as a "strong" incentive to the development of company carpool plans. APCD and Commuter Computer will work closely together in directing employers to establish emergency carpool plans.

C. CARPOOL MONITORING. CPO will work with CALTRANS to continue to monitor auto occupancy.

Nov. 1977 — D. MODEL CARPOOL ORDINANCE. CPO will draft a model carpool ordinance to recommend for local jurisdiction adoption to require that employers give carpool incentives.

II. MID-TERM ACTIONS

Dec. 1977- Feb. 1978 — A. Present model carpool ordinance to local jurisdictions for adoption.

Nov. 1977 — B. ADDITIONAL ACTIONS. Evaluate and recommend other actions to encourage carpools, vanpools, and buspools. Prepare a recommended program including prioritized actions, funding sources, and responsible implementing agencies. This program will complement the work already underway by Commuter Computer and the early actions. Study existing CALTRANS carpool program for lessons learned, as well as other programs throughout California. Evaluate vanpool incentives for potential effectiveness within the San Diego Region. Include provision for accelerated depreciation and/or investment credit for sponsoring employers. Study experience of existing vanpool systems. Evaluate subscription transit incentives for potential effectivess. Study the experience of existing buspools within and outside the region.

TACTIC T3
COMMUNICATIONS AND HOME GOODS DELIVERY

TACTIC DESCRIPTION

Tactic T3 proposes a program to achieve the substitution of communication for transportation and the increased availability and use of home goods delivery services. The emphasis will be on the former, concentrating on the use of existing equipment: the telephone, mail, radio, television, audio and video cassettes, cable TV, telecopiers, and portable computer terminals.

LEAD AGENCY: CPO, Member Jurisdictions

PERFORMANCE EXPECTATION

The objective of this tactic is a 2% reduction in VMT and vehicle trips by 1980 and a 10% reduction by 1990.

TACTIC T3 RHC EMISSION REDUCTION

Source	1980	1985	1990	1995	2000
Light Duty Passenger and Truck VMT and Trips	2.0%	5.0%	10.0%	10.0%	10.0%
RHC Reduction - Tons/Day	1.1	1.8	2.9	2.8	3.2

IMPLEMENTATION PROGRAM AND SCHEDULE

I. EARLY ACTIONS

Date

July 1977 A. TELECOMMUNICATIONS ANALYSIS. Analyze and prepare a report on the following regarding communications as a substitute for travel:

1. The process by which communications substitutes for travel has or will occur in the San Diego Region.
2. Evidence of trend occurring and projections for future in the San Diego Region.
3. The barriers to expansion of telecommunications as a substitute for travel in the San Diego Region.
4. How can CPO or other government agencies in San Diego most effectively influence the use of telecommunications as a substitute for travel.

5. Method of estimating and monitoring the impact of telecommunications on auto travel.

August 1977 B. WORKSHOPS. Conduct a workshop(s) to determine the best way to bring the full range of technology and social innovations in telecommunications before the public.

1. Possible attendees: government agency operations and personnel heads, Pacific Telephone sales and technical persons, representatives from CATV stations.
2. Possible topics for workshop agendas:
    a. Government demonstration programs to show reduction in motor vehicle travel through use of telecommunications. Results to be monitored by use of motor vehicle travel logs.
    b. Role of CATV network in demonstrating what can be done in public service applications of telecommunications as a substitute for travel.
    c. Role of government as desirable or undesirable in accelerating application of telecommunication technology; adoption of program by local jurisdictions.
    d. Legislation necessary to lower barriers to expansion of telecommunications.
    e. How can effectiveness of Tactic T3 be monitored.

Oct. 1977 C. HOME GOODS DELIVERY PROGRAM.

1. Analyze the following:
    a. Past, present, and projected trend in this type of service in the San Diego Region including catalog sales by telephone and mail, and in-person purchases delivered by private company vehicles.
    b. Reasons for decline (or failure) in the past of such schemes as "Telemart".
    c. Types of businesses most suitable for home goods delivery.
    d. Types of incentives/disincentives most appropriate to encourage businesses to set up home goods delivery services.
    e. Barriers to expansion of home goods delivery services.
2. If found feasible, prepare a program for expansion of home goods delivery service.

II. MID-TERM ACTIONS

June 1978 A. Formulate and implement a public information program to encourage the use of telephones, the mail, and other forms of communication to reduce vehicle trips.

June 1978 B. CPO will add a "Communications Element" to 1978 RTP Revision including policies defining role that telecommunications is to play in reducing motor vehicle travel.

TACTIC T7
MAXIMUM BICYCLE SYSTEM

TACTIC DESCRIPTION

This tactic envisions a major expansion of the bicycle transportation system including the adopted regional bicycle route system, community oriented routes, bicycle feeder systems to public transit, employer incentives, and facilities such as theft resistant racks, connections with express bus service, showers, and locker rooms. Highest potential for use of bicycles would be in balanced communities where most destinations are within biking distance of residences.

LEAD AGENCY: CPO, Member Jurisdictions

PERFORMANCE EXPECTATION

The objective of this tactic is a 1% reduction in VMT and 4% reduction in vehicle trips beginning in 1980.

TACTIC T7 RHC EMISSION REDUCTION

Source	1980	1985	1990	1995	2000
Light Duty Passenger VMT	1.0%	1.0%	1.0%	1.0%	1.0%
Light Duty Passenger Trips	4.0%	4.0%	4.0%	4.0%	4.0%
RHC Reduction - Tons/Day	1.7	1.2	1.0	0.9	1.1

IMPLEMENTATION PROGRAM AND SCHEDULE

I. EARLY ACTIONS

Date

August 1977 & Annually — A. TRANSPORTATION IMPROVEMENT PROGRAM. In each revision of the TIP, priority for early construction will be given to those bicycle route projects that would encourage commuter and shopping trips. The CPO Bicycle Facilities Ad Hoc Committee will establish priorities using as criteria:

1. Elimination of problem areas on routes which would provide relatively safe travel use, given the character of the users and route conditions. These must be indicated by the applicant.

2. Service to high use activity centers (economic, educational, cultural, recreational), including access to other transportation systems (i.e., park and ride facilities). In the absence of bicycle ADT data, it will be assumed that higher density urban areas generally have higher demand.

3. Connection to and continuity of longer routes provided by other means (e.g., State Department of Parks and Recreation) or other jurisdictions to improve regional continuity.

4. Identification of local effort in providing pedestrian and bicycle routes (either through funding or local participation such as assistance in door-to-door surveys).

5. Development in conjunction with adopted "Scenic Highways" route.

Nov. 1977 B. COMMUTER GUIDE. CPO will publish "Guide to Commuting and Shopping by Bicycle in San Diego" for distribution to major employers, shopping centers, etc. Booklet will include:

1. Maps of regional/local bike routes.
2. Route to follow in various home to work situations.
3. Maps of subregional areas (i.e., Pacific Beach) showing shopping centers having storage facilities and recommendations on streets best suited for bicycle use.
4. Safety Hazards - how to avoid.
5. How to use various security and storage facilities.
6. Maps of bus routes providing storage facilities (existing and proposed).
7. How to carry packages on a bicycle, hardware available, cost, etc.

Nov. 1977 C. MODEL BICYCLE ORDINANCE. Draft a model bicycle ordinance to recommend for local jurisdiction adoption to require local bicycle incentives and facilities in residential, commercial, and institutional developments, and to deal with other issues such as bicycle registration.

II. MID-TERM ACTIONS

Dec. 1977 to Feb. 1978 A. ORDINANCE ADOPTION. Present ordinance to local jurisdictions for adoption.

June 1978 B. BICYCLE PROGRAM. Prepare a commuter bicycle program for adoption by CPO as part of the 1978 RTP Revision. The program will deal with the following issues:

1. Methods to deal with the barriers to more extensive use of the bicycle in the San Diego Region including safety, topography, package carrying requirements, and others.

2. Expanding the "bike-and-ride" program to include bus routes to high-use activity centers such as San Diego State University.

3. Providing bicycle storage and security facilities at shopping centers and places of employment.

C. PROGRAM ADOPTION. Present program for adoption and implementation by local jurisdictions and other responsible agencies.

Appendix L

RESOLUTIONS 218889, 218890 AND 218891
OF THE SAN DIEGO CITY COUNCIL

RESOLUTION No. 218889

R. 78-249

Adopted on JUL 20 1977

BE IT RESOLVED, by the Council of The City of San Diego as follows:

That it be and it is hereby certified that the information contained in the Environmental Impact Report No. 77-01-14 has been completed in compliance with the California Environmental Quality Act of 1970 and the State guidelines pursuant thereto, and that said Environmental Impact Report has been reviewed and considered by this Council.

APPROVED: JOHN W. WITT, City Attorney

By C. M. Fitzpatrick
C. M. Fitzpatrick
Senior Chief Deputy

CMF:vl:453
8/11/77
Or. Dept.: Water Utilities

Passed and adopted by the Council of The City of San Diego on July 20, 1977, by the following vote:

YEAS: Johnson, O'Connor, Hubbard, Williams, Morrow, Gade, Strobl, Haro, Wilson.

NAYS: None.

ABSENT: None.

AUTHENTICATED BY:

PETE WILSON,
Mayor of The City of San Diego, California.

EDWARD NIELSEN,
City Clerk of The City of San Diego, California.

(SEAL)

By KATHLEEN MARTINEZ, Deputy.

I HEREBY CERTIFY that the above and foregoing is a full, true and correct copy of RESOLUTION NO. 218889 passed and adopted by the Council of The City of San Diego, California, on July 20, 1977.

EDWARD NIELSEN,
City Clerk of The City of San Diego, California.

(SEAL)

By Kathleen Martinez, Deputy.

(Rev. 12/71)
lm

RESOLUTION No. 218890

R. 78-279

Adopted on JUL 20 1977

BE IT RESOLVED, by the Council of The City of San Diego as follows:

That with respect to Environmental Impact Report No. 77-01-14, adopted by Resolution No. 218889, the Council does hereby select Alternative 4.

BE IT FURTHER RESOLVED, that the City Manager be and he is hereby authorized to apply for a Federal Grant from the Environmental Protection Agency to accomplish the purposes set forth in Alternative 4.

BE IT FURTHER RESOLVED, that the staff is hereby directed to proceed with the hiring of a Consulting Engineer under the Federal Grant Step II funding, with provision made in that contract to design Alternate 1 in the event the law is subsequently amended.

BE IT FURTHER RESOLVED, that the staff is hereby instructed to continue its efforts of investigation, studies and research into waste water reclamation and recycle, stressing the need for resource recovery, energy savings, energy generation and food production, incorporating innovative devices and keeping the Council appraised of efforts in this direction.

APPROVED: JOHN W. WITT, City Attorney

By
for C. M. Fitzpatrick
Senior Chief Deputy

CMF:vl:453
REV. 8/15/77
Or. Dept.: Water Utilities

L-4

Passed and adopted by the Council of The City of San Diego on July 20, 1977, by the following vote:

YEAS: Johnson, O'Connor, Hubbard, Williams, Morrow, Gade, Strobl, Haro, Wilson.

NAYS: None.

ABSENT: None.

AUTHENTICATED BY:

PETE WILSON,
Mayor of The City of San Diego, California.

EDWARD NIELSEN,
City Clerk of The City of San Diego, California.

(SEAL)

By KATHLEEN MARTINEZ, Deputy.

I HEREBY CERTIFY that the above and foregoing is a full, true and correct copy of RESOLUTION NO. 218890 passed and adopted by the Council of The City of San Diego, California, on July 20, 1977.

EDWARD NIELSEN,
City Clerk of The City of San Diego, California.

(SEAL)

By Kathleen Martinez, Deputy.

(Rev. 12/71)
lm

RESOLUTION NO. 218891 R. 78-246

JUL 20 1977

BE IT RESOLVED, by the Council of The City of San Diego, as follows:

That pursuant to the provisions of Section 21081 of the California Public Resources Code (California Environmental Quality Act) the following findings of mitigation, feasibility and project alternatives are adopted in connection with Environmental Impact Report No. 77-01-14:

1. IMPACT: The major environmental impact of any of the project alternatives, is "growth inducement." To the extent that expansion of the sewerage system capacity would accommodate growth, the project would have significant environmental effects.

SPECIFIC MITIGATION: The significance of this impact is reduced because the ultimate design capacity of the Metropolitan Sewerage System is 234 million gallons per day. None of the alternatives exceed that volume. The project alternatives are concerned with treatment methods rather than capacity.

Only the "no project" alternative would avoid the consequences of growth. Adoption of this alternative would result in the continuation of primary effluent discharges to the ocean at existing volumes and incremental addition of more sewage from projects already approved and/or under construction in the service area. This continued discharge of primary effluent would be contrary to the provisions of P.L. 92-500. In addition, adoption of this "no project" alternative would probably result in sanctions imposed on the City by State and/or Federal agencies, possibly in the form of moratoria. These sanctions would probably result in severe social and economic dislocations in the local and regional economies, which are already under stress, with high levels of unemployment.

The location and timing of growth is managed by local community plans, general plans and the regional comprehensive plan. Availability of all public services including public safety, school, utilities, transportation, etc. are all requirements under existing and developing land use policies. Natural resource constraints such as water and air quality, energy and water conservation, biology, topography, geology, and relationship with existing improvements and impacts on human beings are other considerations which guide growth and development decisions and upon which individual projects are evaluated. Growth enducement as a separate factor is analyzed in the environmental impact reports on each project.

2. IMPACT: Implementation of any of the alternatives would have certain adverse impacts on the receiving ocean waters.

SPECIFIC MITIGATION: Selection of the alternative to continue only primary treatment would be the more adverse, inasmuch as greater pollutant loads would be discharged, and the ability of the ocean to absorb them without substantial degradation is problematic. The effects of secondary treated discharges are also somewhat problematic, but they are known to be less severe than those of primary effluent.

The adoption of a plan for conversion to secondary treatment is in effect a mitigation measure by which the Metropolitan Sewerage System would gradually reduce the level of pollutants presently being discharged to the ocean. While degradation of the ocean waters by present discharges has not been absolutely established, there is evidence of changes in the sediments and benthic marine animal communities, and the upgrading to secondary treatment would ameliorate the existing conditions and prevent a worsening of conditions in the receiving ocean environment as discharges increase with population growth in the region.

3. IMPACT: Increased population growth brings with it the possibility of an increase in levels of air pollutants already exceeding State and Federal clean air standards.

SPECIFIC MITIGATION: Many strategies for reduction of pollutant emission have been preempted by State and Federal agencies so that mitigation measures for these factors are beyond the capability of the City to implement.

In these areas, mitigation efforts must remain in the hands of various regulatory agencies at higher levels of government. Land use controls are among available strategies for influencing growth patterns, but these are distributed among a large number of local agencies as cited in paragraph one above. Some mitigating measures have been adopted by the various jurisdictions in their adoption of the Regional Air Quality Strategies, an early step in the mandated Air Quality Maintenance Program. Also land use controls as a part of regional growth management strategy could be jointly exercised by some or all of the local jurisdictions within the service area, which could ameliorate the air quality impacts of continued population growth.

GENERAL MITIGATION: An integral part of the project is the continuing effort on the part of the City to work toward a water reclamation program which would utilize the water for beneficial uses, even to the ultimate introduction into the domestic water supply system. This future reclamation would result in reducing the tremendous energy requirements involved in importing water to San Diego from Northern California and the Colorado River. This would partially mitigate the increased energy consumption inherent in conversion to a secondary treatment method.

The project proposes to provide for facilities to treat the sewage generated in the City of Tijuana which is presently being discharged to the ocean untreated. This feature of the project is a mitigation of the discharge of pollutants to the receiving ocean environment as well as benefiting San Diego, which is subject to severe public health hazards in the event of failures in the Tijuana sewerage system.

APPROVED: JOHN W. WITT, City Attorney

By
C. M. Fitzpatrick
Senior Chief Deputy

CMF:vl:453
8/10/77
Or. Dept.: Water Utilities

Passed and adopted by the Council of The City of San Diego on July 20, 1977, by the following vote:

YEAS: Johnson, O'Connor, Hubbard, Williams, Morrow, Gade, Strobl, Haro, Wilson.

NAYS: None.

ABSENT: None.

AUTHENTICATED BY:

PETE WILSON,
Mayor of The City of San Diego, California.

EDWARD NIELSEN,
City Clerk of The City of San Diego, California.

(SEAL)

By KATHLEEN MARTINEZ, Deputy.

I HEREBY CERTIFY that the above and foregoing is a full, true and correct copy of RESOLUTION NO. 218891 passed and adopted by the Council of The City of San Diego, California, on July 20, 1977.

EDWARD NIELSEN,
City Clerk of The City of San Diego, California.

(SEAL)

By Kathleen Martinez Deputy.

(Rev. 12/71)
lm

☆U. S. GPO: 1977-792-694